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PROVIDING FOR THE WIRING IN THE DESIGN OF THE BUILDING.

A dozen years ago or so there was apparently little attention given, as a rule, to providing proper location and space for the electric wiring when a new building was being designed. Even in the case of the larger buildings, the practice seems to have been common of working out the other details of design carefully, and then leaving it to the electrician or the electrical contractor to arrange the wiring as well as he could under fixed conditions already imposed. The result often was that the electrical construction proved relatively costly, and that the system when finished was badly lacking in the elements of neatness, flexibility and adaptability to its purpose which might easily have been secured if the electrical installation had been given proper thought when the plans for the building were drawn.

Fortunately, the more progressive architects have abandoned the above practice now, in so far as it relates to large buildings of the better class. The electrical engineer or the electrical contractor, or both of them, are usually called upon at the proper time to draw up plans for the electrical work, and these are incorporated in the design of the building. In the case of small buildings, however, this matter is still too frequently overlooked. The crude and unsightly wiring, poor arrangement of meter locations, outlets, distributing centers, and the like which one so frequently sees, are the logical results of this, oftener than they are caused by a lack of skill on the part of the contractor. The best that the contractor himself can do toward securing a remedy for this condition doubtless is to make the earliest possible appeal to the architect, or to the property owner himself, when a given job is to be undertaken. If the property owner were shown in time the real advantages of high-class wiring, he would in perhaps a majority of cases see to it that the necessary provisions were made for easily securing the right kind of construction.

Another practice which is even worse than the one just mentioned is that of permitting the property owner to cut the money allowance for the electrical work in a given new building to the lowest possible figure. To gratify the owner's desire to make the net cost of the building low, expenses are sometimes cut in every possible way, and it is usually the electrical work that suffers most in the reduction. The electrical contractor cannot afford to miss an opportunity to discourage this sort of thing. He should make use of all reasonable

means to convince his customer that the ultimate value of any modern building depends, in a measure that is very large, upon how well it is equipped for electric service, and should insist always on a liberal allowance for the electrical work, and upon the other necessary provisions for its correct installation.

THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

During the coming week the National Electrical Contractors' Association will hold its annual convention at Denver, Colo. Sessions will be held on Tuesday, Wednesday and Thursday, and on Friday a trip will be made over the famous Moffat route to Corona, on the Continental Divide.

The National Electrical Contractors' Association has thrived in a most healthy and happy fashion. During the last few years, particularly, the membership has greatly increased, and the importance and influence of the organization has loomed large in the electrical industry.

The improvement of electrical construction methods and the development of higher standards in the selection of material have been fostered to the advantage of all. In fact, this organization has taken a leading part in whatever effort has been made toward the improvement of conditions in the industry, whether of an ethical, commercial or professional nature.

Arrangements for the Denver convention are complete. A large attendance is assured. A program of unusual attractiveness has been prepared, and the entertainment features will be in keeping with those of previous conventions. This has been a conspicuous feature of the gatherings of the National Electrical Contractors' Association. Altogether, this convention is of the most definite and pressing importance to the entire electrical industry, and it will be worth considerable sacrifice to be registered among those presest at Denver next week.

WIRING FOR WINDOW ILLUMINATION.

A systematic study of the science of artificial lighting usually includes a number of matters other than those relating directly to the light source itself. It appears, though, that there is one subject which is not, as a rule, given as much thought by those engaged in the study of problems in illumination and in teaching others what is best in the art, as it should be. This subject has to do with the design of circuits for supplying power to lamps and for the control of lights after an installation has been completed. To the practical man whose duties include the design of lighting schemes of the commoner types, nothing is of greater importance than a thorough knowledge of what can be done in the way of arranging switches for the most convenient control of lights and of supplying proper and adequate outlets and receptacles to meet present needs and to insure that the circuits may be readily adjusted to meet any ordinary changes in the lighting service which may subsequently become desirable.

Ignorance and carelessness in the matter just mentioned sometimes lead to some very awkward and annoying conditions in show-window lighting. The designer of the lighting scheme for a given window satisfies himself with a scheme of illumination sufficient to fulfill requirements then existing and those easily seen to be probable, and the wiring is done accordingly. Then when some unforeseen demand for extra current in the window arises, the wiring is found to be inadequate and unsatisfactory. This is a fact to which many of the more experienced window trimmers will attest.

In the wiring of windows to be used in the display of merchandise there should not only be provided a liberal supply of properly located sockets for lamps, when the wiring is installed, but, in most cases, it is also well worth while to install two or more receptacles for attachment plugs. In the average window there is liable to be, at almost any time, a demand for special lighting which makes the presence of such receptacles highly essential. Moreover, aside from the lighting, the desire to employ fans or other special apparatus is always liable to make receptacles necessary.

CONNECTED-LOAD RECORDS.

At the risk of some criticism we again urge the importance of keeping comprehensive records of connected loads on central station distributing systems. Why it is that so many companies are remiss in this particular is not easy to explain, but continual observation of practice in different parts of the country shows that in too many cases an appalling ignorance exists in relation to the real engineering details of the installations supplied with electrical service. The local company can doubtless tell at short notice what the total horsepower and number of motors are in Smith's shoddy mill, but that sort of information cuts little figure unless it is backed up by full details as to the size of machinery, its make, capacity, speed, and the driving arrangements concerned. To all whom it may concern: Get a cheap card index or even a loose-leaf book, and every time a new power or lighting contract is signed and service inaugurated, put down the full details—and there are enough of these in every case to make a lazy man sigh for a seat on a park bench—and if any tests are made of the energy consumption and maximum demand, the load-factor, hours of service and average monthly bill may be added to these; and then when another customer in the same line of business starts in to buy a steam or a gas engine, you can show him some really practical data that mean something and not be obliged to serve him with a lot of commonplace information gathered from incomplete sources and more or less covered with cobwebs. Follow the lines of data-sheet compilation which appear in the pages of this journal from week to week, and it will not be many months before you have a body of information on hand which will not only help to get

new business, but which will pass current as material for expert testimony in courts of law and before regulating commissions.

THE EXTRAVAGANCE OF POOR ILLUMINATION.

Attention has frequently been called to the benefits resulting from adequate illumination in industrial plants. Better work, larger outputs, greater freedom from accident, and better temper among the workers prevail where the conditions of illumination are suited to the work to be done. Managers of industrial plants seldom realize, however, the extent to which work is handicapped and the cost of production increased by inadequate illumination. Even where a well designed plant has been installed, so that the initial conditions of illumination are the best obtainable, it is not always realized that the deterioration in the reflecting power not only of walls and ceilings, but of the reflectors themselves, may cause a serious decline in the adequacy of the lighting.

Some results of actual tests were given by Mr. C. E. Clewell in a paper presented at the joint meeting of the American Institute of Electrical Engineers and the Illuminating Engineering Society and abstracted in our report in the last issue, and will bear emphasis in this connection. It was there shown that the accumulation of dust and dirt upon installations where glass reflectors were used might in the course of a dozen weeks reduce the flux of light by 30 per cent or more. Such results are obtained not only in factories, but also in office buildings where it might be supposed that dust would not be so prevalent.

These results indicate the necessity of close attention to reflectors and the regular cleaning of them. This is especially important in indirect systems of lighting, where the reflecting surfaces face upwards and present a better lodging place for dust than do those reflectors which throw the light downward. In cases where it is not practical to clean reflectors regularly, or where it is likely that proper attention will not be given to them through neglect, it is well in designing the installation to make allowance for this rapid deterioration in the over-all efficiency of the lighting equipment. Usually the tests which are carried on after an equipment has been installed give values which apply only to the initial condition of the equipment, and the fact that the illumination intensities then measured meet all the requirements is no guarantee that the same statement will apply after a few months of use.

The question of regular cleaning of reflectors should be based upon the economics of the situation and a statement of the loss of value in monetary units will easily enable the plant manager to determine the frequency of cleaning which will give the highest returns.

Mr. Clewell has given some interesting data connecting the cost of cleaning with the loss occasioned by the accumulation of dirt, since a failure to clean reflectors means a larger initial installation and a larger daily consumption of energy for the same degree of illumination. The relation of the cost of cleaning to the interest upon the increased cost of installation should show the proper interval in any particular case. It will usually be found that cleaning not less than once per month is a commercially advantageous practice.

Figures giving the relation between the cost of illumination and the average wage list indicate that a very small change in the facility for turning out work will largely overbalance the corresponding cost of a good lighting system. There are few cases in which the daily cost of the energy used to supply illumination is as great as the wages represented by a working period of five minutes, and consequently if five minutes of the worker's time could be saved by doubling the energy used for illumination, the net result would be a favorable balance. Such figures as these make it very evident that it is commercially profitable to provide such illumination as will result in the turning out of the greatest product. In addition to this direct gain there is the additional saving that results from the lessening of accidents in cases where the illumination is good. It has been clearly demonstrated that the proportion of accidents generally increases in cases where the illumination is inadequate.

THE DEVELOPMENT OF LAND TELEGRAPHY.

Some figures have recently been made public regarding the development of the Western Union Telegraph business which establish an interesting commentary on the new life and stimulus that may be injected into a business through the inauguration of new ideas. It is understood that the gross earnings of the Western Union for its fiscal year to end at the last of next month will easily eclipse all previous records and will reach a total which prior to the advent of American Telephone management would not have been deemed possible. In a short three years the income of a corporation which had apparently ceased to possess any expansive power, has increased a full 33 per cent, with a promise of another $10,000,000 added to its gross inside of the next five years. The present quarter will probably show an increase which is out of all proportion to ordinary conditions. The use of the telegraph has been greatly increased because of the *Titanic* disaster and the two national political conventions recently assembled. The *Titanic* tragedy was the producer of the greatest volume of telegraphic communication of any single event in history. The day the *Carpathia* reached New York, Western Union wires handled 715,000 words, compared with a previous high record for a single day of 433,000 words. The latter was in connection with the Republican national convention four years ago. In addition to the total of land business 45,000 words were cabled to Europe.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.

Twentieth Annual Meeting Held at Boston.

The twentieth annual meeting of the Society for the Promotion of Engineering Education was held in Boston, Mass., June 25 to 29, with headquarters at the Hotel Somerset. This convention took place simultaneously with that of the American Institute of Electrical Engineers, and the joint session held with the latter society will be found reported in our last issue.

Sessions for the reading of papers were held on Wednesday at Harvard University; on Thursday at the Hotel Somerset; on Friday at Wentworth Institute and Massachusetts Institute of Technology, and on Saturday at the Massachusetts Institute. The session on Wednesday was devoted to a symposium of "The Teaching of Physics to Engineering Students." This was led by W. S. Franklin and Barry MacNutt. On Thursday evening there was a symposium on "The Training of Engineering Teachers," led by G. C. Anthony. On Friday there was a symposium on "The Efficiency of Engineering Instruction," led by Frank Gilbreth. On Friday afternoon and on Saturday morning meetings were held which were devoted to the discussion of the equipment for the conduct of engineering laboratories. The different sections were concerned with mining, mechanical, electrical and hydraulic engineering. The electrical section was presided over by J. O. Phelon. Among the papers presented was one by C. Francis Harding on "The Use of the Oscillograph in Electrical-Engineering Research and Instruction." An abstract of this paper follows.

Use of the Oscillograph in Research and Instruction.

In engineering those phenomena incident to changing physical conditions are of supreme importance. The application of physics to stable conditions is fairly simple and the principles involved easy to understand, but when the causes are variable, the effects also vary and performance is more difficult of prediction. The starting and stopping of a train, the lifting and lowering of elevators, and the periodic rise and fall of the turning moment of a reciprocating steam engine are all examples of unstable conditions which must be controlled. As a matter of fact, the operation of all dynamic apparatus involves more or less of those phenomena observable only as a result of rapidly varying causes.

The above applies strictly to electrical phenomena also. In fact, the most important method of transmitting power electrically makes use of these phenomena. Alternating currents would find little practical application were it not for the peculiar properties which a circuit possesses when traversed by currents of this character. Likewise, the opening and closing of switches may cause a circuit to exhibit for the moment properties not common to it when current conditions have become stable.

In order, therefore, to enable the student to grasp the phenomena occurring only when unstable conditions exist, some recording device which will picture to him the changing effects is invaluable. Such a device is the oscillograph. Its extreme sensibility enables it to follow and record the most rapidly varying effects incident to practical electrical circuits and apparatus. It consists of a single loop of fine silver wire, both sides of which lie in a common magnetic field produced by electromagnets. Across the two sides of the loop there is cemented a small mirror, while the two ends of the loop are connected in series or parallel with the apparatus whose action is to be studied. The apparatus as a whole is a current-recording meter, since the motion imparted to the mirror results from the electrodynamic action between the current carried by the loop, and the magnetic field. A beam of light is reflected from the small mirror above mentioned and falls upon a revolving photographic film or a second mirror which is given a synchronous oscillating motion at right angles to that of the former. If the light be thrown upon a photographic film a record, permanent in character, results; but if the projected light falls on the second vibrating mirror a standing wave is projected on the screen, which may be viewed by the operator.

Most efficient use has been made of the oscillograph at Purdue University during the past year in presenting to the students, either by lecture demonstration or in thesis work, the following transient characteristics of electrical current: (*a*) Illustrations of wave distortion. (*b*) Effect of field strength upon the phase relation of current and voltage waves of a synchronous motor. (*c*) Effect of hunting upon armature current. (*d*) Calibration of oscillograph for accurate determination of current, voltage and power-factor. (*e*) Flux distribution in air gap of generators and motors at various loads. (*f*) Effect of core slotting upon flux distribution in air gap of an induction motor.

To determine experimentally the flux distribution in the air gaps of generators and motors, these machines were equipped with a small exploring coil having a throw or pitch equal to that of the armature coils with which the machine was wound. In revolving-armature machine, slip rings and brushes connected this exploring coil to the oscillograph circuit. It is evident that as the coil passes through the magnetic flux, voltages will be induced which will cause currents to flow in the circuit. These currents are practically in phase with the electromotive force generated, since the circuit is practically non-inductive. The currents in turn set the oscillograph mirror in vibration in time phase therewith so that the resulting curve shown on the film or screen is a curve of flux distribution. As a direct-current machine is loaded the air-gap flux is shifted, while the total flux per pole may be increased or decreased. The writer knows of no better way to illustrate this phenomenon to the student than to show him the flux distribution curve at no load and ask him to observe the effects as load comes on.

As a matter of experience the interest of the student and his ability to grasp fundamental principles are very much increased by a careful use of the oscillograph in connection with transient phenomena.

On Wednesday evening the annual dinner was held at the University Club, and was followed by a reception.

On Fridap evening a business meeting and smoker was held at the Hotel Somerset. It was decided to amend the by-laws so as to provide for standing committees on special subjects, the matter being referred to the incoming council for executive action. The election of officers resulted as follows: President, William T. Magruder, of Ohio State University; vice-presidents, L. S. Marks, of Harvard University, and F. W. Sperr, of the Michigan College of Mines; secretary, H. H. Norris, of Cornell University; treasurer, William O. Wiley, of New York.

Sections and Student Branches of American Institute.

There are now 28 sections of the American Institute of Electrical Engineers in the principal cities of electrical activity in the United States, Canada and Mexico. There are also 43 branches of the Institute at the leading technical colleges and universities. Three of the sections (viz., Ithaca, N. Y.; Madison, Wis.; Urbana, Ill.) are located in university towns.

Lectures on Smoke.

The Department of Industrial Research of the University of Pittsburgh has been making an investigation of the smoke problem, and has arranged a series of lectures by the members of its staff. The following subjects are covered in this series of lectures:

(1) The Smoke Nuisance.
(2) Smoke and the Public Health.
(3) Smoke and the Cost of Living.
(4) Smoke and Plant Life.
(5) Methods and Means of Smoke Abatement.
(6) The Effect of Smoke on Buildings and Building Materials.
(7) The Psychology of Smoke.
(8) The Smoke Nuisance and the Housekeeper.

Electrochemical Convention.

The fall meeting of the American Electrochemical Society will be held in connection with the Eighth International Congress of Applied Chemistry, "Section Electrochemistry." The joint meetings have been scheduled for September 7, 9 and 10. On September 7 a meeting will be held in conjunction with the American Institute of Mining Engineers and Section IIIA of the Congress (Metallurgy), the topic being "Electrometallurgy."

The National Electrical Contractors' Association.

A Brief History of Its Origin and Developments, with an Appreciation of the Results of Organization and Co-operation in the Electrical Industry.

By Marshall L. Barnes.

When we look back over the past ten years and recall the various organizations and combinations that have been formed to advance the electrical trades and of the few that remain intact today, disbanding having come about through discords and ruptures and through intervention of the courts, it is interesting to note that the National Electrical Contractors' Association has never reorganized, has never had its work questioned as to its legality, its membership has had a steady growth, and with possibly less than a half dozen exceptions, its organizers are still its active guides. Surely an organization with such a record must have been organized safely and well.

M. L. Barnes, President.

Ernest Freeman, First Vice-President.

J. C. Hatzel, Third Vice-President.

Today, this organization is enjoying the confidence of its allies, is constantly increasing its membership, and consequently the combined purchasing power of the members is reaching into enormous proportions; thus making the association one of the greatest factors in the electrical industry.

Electric lighting and power applications have had a rapid expansion, and those who entered early into the construction line had little time in which to study the financial end or to study out conditions for betterment. Many of the other trades, with years of experience, had found it necessary to do this, and finally the electrical contractor had to stop and look over his condition. The result was the formation of local associations. These proved of much benefit and after such organizations had proven their worth in Buffalo, Rochester, Syracuse, Utica, Troy and in New York City, these bodies met at Buffalo and formed, in 1899, what still exists as the Electrical Contractors Association of New York State. Some three years later came the Pan-American Exposition, at Buffalo, and the officials of the State Association conceived the idea of a greater expansion of the work that had proven most beneficial to the craft. Invitations were issued to contractors in various states to meet them at Buffalo with the idea of forming a national organization. The response was most gratifying, and it brought together men who today are known from coast to coast as among the greatest factors in the trade. Many of these men have never tired of the work and are still in the harness put-

John R. Galloway, Treasurer.

W. H. Morton, Secretary.

J. C. Sterns, Sergeant-at-Arms.

ting in their time and energies for the betterment of anything and everything that tends toward the good of all.

The contractor has come to know the good there is in organization and in the past two years the national association has more than doubled in membership and almost daily applica-

R. C. Blerdemann, Director.

tions are being received from various points in the United States, showing the reputation is widespread of the work that has, and is being accomplished.

Much important work has been done that has not only benefited the contractor, but has affected the whole electrical business. Among these have been the issuing of standard outlet symbols, which is in general use among the architects and has been adopted

W. L. Hutchison, Director.

as the standard by the government and among many engineering societies. The "Data and Sales Book," is considered the greatest work that has ever been issued in the electrical trade for the resale of goods, for quick figuring of contracts, and for general information. This work is widely used, not only by contractors, but it is in the hands of many of the manufacturers and jobbers, who consider it indispensable. The present National Electrical Code rules, that are being used for wiring, is very largely due to the work of the National Electrical Contractors' Association committee on Underwriters Rules. The "Electrical Equipment of the Home," a 40-page booklet, is considered the best guide that the architect has ever had for laying out specifications, and is the joint work of the National Electric Light Association, the National Electric Lamp Association, and the National Electrical Contractors' Association. This has had a distribution of nearly one hundred thousand copies among architects and builders. The *National Electrical Contractor,* a monthly publication, issued by the association, goes out to about 2,500 contractors, full of valuable information, and is one of the most valuable modes of advertising that goes out from the

J. A. Fowler, Director.

trade. The organization has devised plans for conduit wiring systems which will be a great saver in figuring specifications, giving the sizes of conduits up to four-inch; and the various combinations of wires and cables that the different conduits will take, which will be issued shortly among the members. Much work has been put on this and it is considered perfect in all its details, and no doubt will be made a standard guide.

These and many other good works have come from the hands of the National Electrical Contractors' Association, which continually keeps them before the electrical trades.

The splendid cooperative spirit that exists today among all the organizations in the electrical field can be very largely credited to this organization and it has tried to religiously carry this out and to foster a goodly feeling among all the interests. It took many years to educate all to the fact that the general good depended on all getting together. There is probably no line of trade today that is more firmly cemented than that of the electrician and the manufacturer of machinery and supplies that enter into the installations of power and light.

The contractors have made a special feature in their conventions of the

Seth B. Wetherbee, Director.

social side of organization effort, and it has always been a pleasure for those outside of the organization to be with them. This has brought out the fact that no matter how bitter the competition, there were many good points in the competitor and the longer they have associated together the stronger have the friendships of these men been cemented, until a more fraternal body it would be hard to find. Friendships have been made that only the passing

James R. Strong, Director.

away of the individuals will sever.

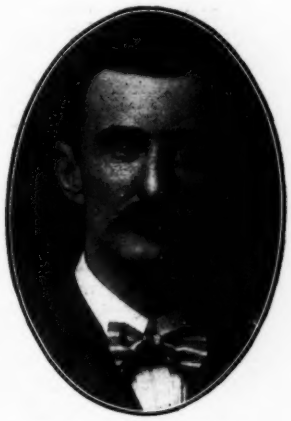
The contractor, the lamp and lighting interests, the manufacturer and the jobber will soon be represented by a committee from each of these organizations, forming a joint committee on co-operation. Surely such a combination would not have been imagined a brief time back. With a goodly feeling existing between these great factors

in the electrical trade only untold good will result.

We are surely on the verge of better things, and this is to be brought about, not by harsh criticism of our competitors, but by kindly words and a pleasant thought, that there is some good in everyone, and especially the man who follows the electrical lines is possessed of all the virtues with which mortal is blessed.

James S. Hilton, Director.

J. T. Marron, Director.



W. M. Clower, Director.

Program of Denver Convention of the Electrical Contractors.

As previously announced, the annual convention of the National Electrical Contractors' Association will be held in Denver, Colo., July 17, 18 and 19. At the opening session on the morning of July 17 there will be addresses by Governor Shafroth on "The Resources of Colorado;" by M. B. Bliss on "The Architect and the Contractor;" and by A. F. Traver on "The Relations Between the Central Station and the Contractor." Mr. Bliss is president of the Denver Chapter of the American Institute of Architects, and Mr. Traver is superintendent of the Denver Gas & Electric Light Company. All persons interested in the electrical industry are invited to attend the opening meeting.

In the afternoon there will be a sight-seeing trip by automobile and in the evening there will be a reception and dance at the Albany Hotel.

A business session for members only will be held on the afternoon of July 17 and the morning and afternoon of July 18. On the evening of Thursday, July 18, the annual dinner of the organization will be held, to which the ladies and representatives of other branches of the industry are invited. This will be followed by a vaudeville performance.

On Friday, July 19, an all-day trip will be taken over the Moffat Railroad to the Continental Divide. This trip furnishes some of the most delightful scenery which can be reached from Denver.

W. R. Engleby, Director.

Adelbert Hubbard, Director.

P. N. Thorpe, Director.

London Conference on Wireless Telegraphy.

The International Radio-Telegraphic Conference, which has been meeting in London, has decided to hold the next conference in Washington, D. C., in 1917. The leading points in the recommendations adopted by the conference are as follows: regulation to prevent interference in crowded areas; all ships must remain silent for ten minutes each hour listening for distress calls; the wave-lengths adopted for commercial business are 300 to 600 meters for short distances, and 1,800 meters for longer distances; the American proposal for a commercial wave-length of 800 meters was rejected; weather observations are to have the right of way over commercial dispatches; rival wireless companies must interchange business.

At future congresses the United States, Great Britain, Russia, Germany and France are each to have six votes; Italy to have three; Spain and Portugal two each, and other nations one each. Heretofore each country has had a single vote. 160 delegates, representing 37 countries, were in attendance at the conference. Meetings were held at the building of the Institution of Electrical Engineers, Victoria Embankment, London.

Electrical Construction

EQUIPMENT AND WIRING IN AN ELECTRICALLY DRIVEN FIRE-PUMP INSTALLATION.

A Detailed Description of a Modern Plant.

The value of automatic water-sprinkling systems as a means of safeguarding against fire loss is well recognized by insurance companies. Property owners, too, are coming more and more to a correct appreciation of this sort of protection, with the result that in modern buildings of certain types the absence of its appears to be becoming rather exceptional now. In the larger buildings it is common practice to provide a special pump for keeping the pressure in the sprinkler lines at the amount requisite for proper protection. By driving the pumps with an electric motor operated through a correctly designed and properly wired control panel, the operation of the entire system may be made altogether automatic and thoroughly reliable.

Specifications covering motor-driven fire-pump installations differ slightly among different sections of the country, depending upon what board of fire underwriters has jurisdiction. However, the requirements of different boards are sufficiently uniform in all the more important details to make it possible for one to get a fairly comprehensive idea of such specifications from the study of those of a single board. The requirements of the Chicago Board of Underwriters are given in the following notes. Moreover, in view of the frequency with which electricians are now called upon to put in such installations, or to take care of plants already installed, it is believed that a complete description of a modern plant is worth while, and such a description is therefore also incorporated in this paper. The plant described is in The Fair, one of the largest department stores in Chicago. A wiring diagram of the motor-control board is included, and the various circuits explained.

The Chicago Board of Underwriters specifies that the pump motor may, when of the direct-current type, be either shunt or compound-wound, but that the interpole motor is preferable. Alternating-current motors must be of the slip-ring type. All windings must be thoroughly impregnated with waterproofing compound. All motors must be directly coupled to the pump shaft, flexible coupling making use of leather belt not being acceptable.

The motor must be fully inclosed with no openings below the center line except where necessary to provide access to brushes. All covers which provide access to motor brushes or slip rings should preferably be hinged to the motor frame and secured in position by not less than four winged bolts. These covers should also be close fitted with rubber gaskets.

It is required that the motor be ventilated by means of a suitable fan on the motor shaft either inside or outside of the motor casing, preferably drawing rather than blowing air through the casing, with the inlet at the top over the commutator or slip rings, and the discharge on in-board side above the center line. Air inlet and outlet must have suitable flanges for bolting sheet-metal pipe connections, or, if desired, inlet and outlet openings may be protected by suitable louvres cast integral with the motor frame.

The motor leads, including connections to slip rings, must enter the frame above the center line, through holes threaded for conduit connection. No connections or auxiliary resistance is allowed outside of the casing.

All bearings must be made with removable sleeves and with ring oilers having ample storage wells with indicator and drain; also large inspection holes with hinged covers.

The motor must have a net efficiency of at least 85 per cent. It must be thoroughly tested in the shop where built, and a copy of the shop test must be submitted where acceptance tests are made after installation. Acceptance test must consist of not less than two hours, nor more than ten hours, continuous operation. The temperature rise in the windings must not exceed 40 degrees Centigrade, and bearings must run cool.

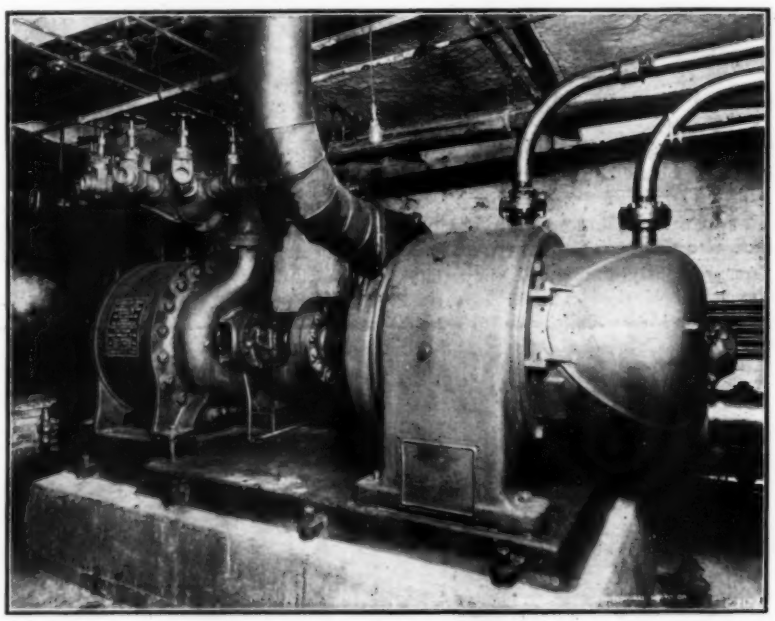


Fig. 1.—View of Motor and Pump.

Controllers must be of the combined automatic-manual type, preferably so designed that either manual or automatic operation may be obtained without the use of throw-over switch or other transfer medium.

It is specified that the automatic operation shall be initially actuated by a pressure governor acting directly on the winding of a solenoid or other

device or devices, which in turn shall close the main contact and a series of rheostatic switches admitting current to and cutting out starting resistance from the motor circuit. The period of motor acceleration must ordinarily not exceed 10 seconds, and such acceleration period must be governed by either a suction air dashpot or other device. The manual operation should be obtained from a crank or lever by which, without change of motion, the main contact and rheostatic switches are closed in proper sequence. All devices must return to starting position in case of failure of voltage, and means are required for limiting the rapidity of acceleration when the controller is operated manually.

When two independent sources of current supply are provided, it is required that there be mounted on the control panel a double or triple-pole, double-throw knife switch, so connected that the motor may be operated from either service line. Where only one service connection is installed, a double or triple-pole, single-throw knife switch must be provided. The panel must also contain two single-pole circuit breakers, for direct current, and a triple-pole circuit-breaker for alternating current, calibrated to 300 per cent above normal motor current. There must be two pilot lamps, one which will indicate the presence of current on the line, and another which lights only when the full operating cycle of the panel is complete. Other apparatus required on panel-board is as follows: Voltmeter, ammeter resistance of the supported-grid type and contacts, auxiliary field resistance which will increase motor speed 10 per cent where direct-current is used and an approved automatic governor and recording wattmeter. All wiring in the back of the board must be flame-proof except where bus-bars are used. Wires of opposite polarity must be rigidly supported.

Overload release devices are not permitted, nor is the use of fuses allowed except in the voltmeter and pilot-light circuits.

The panel must be constructed of a high-class slate supported by an angle-iron frame, all inclosed in a ventilated splash-proof sheet-iron or steel inclosing case with hinged doors both front and rear. The supporting frame must be so arranged that the bottom of the slate will be not less than 24 inches above the floor.

No iron to iron bearings are permitted and all metallic parts shall be of phosphor bronze except where magnetic qualities are essential.

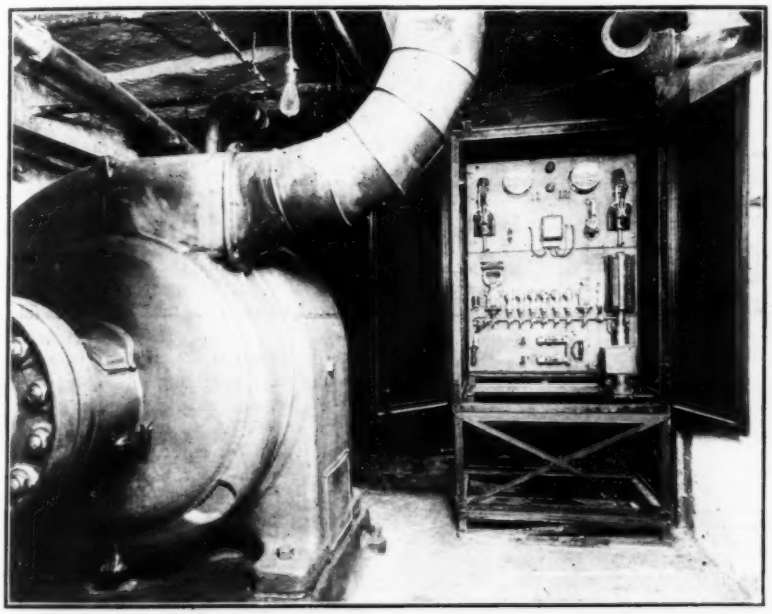


Fig. 2.—View of Motor and Starting Board.

The test of the control board is required to consist of not less than two nor more than four hours continuous and successful operation, figuring not less than three complete operations of the starter per minute. The cabinet is closed at the beginning of the test and remains closed until end. Temperature inside of cabinet should not exceed 65 degrees Centigrade at end of the test.

The National Electrical Code shall govern the construction of the control panels except as modified by the above specifications.

There must be no interruption in the voltage of service supplying current to the motor. Adequacy of the current supply is judged in each case by inspectors from the office of the Chicago Board of Underwriters. Two service connections must be provided from independent mains where mains are carried on pole lines. All overhead mains adjacent to the plant or exposing plants must be run with special reference to freedom from damage in case of fire. One service connection will be required from an Edison underground system. No fuses are allowed in primaries or secondaries of transformers where alternating current is used, nor are fuses permitted in direct-current mains.

Feeders must be lead-incased cable run in continuous metal conduit from street mains into approved metal cabinet in motor room; joints, if any, must be of wiped-lead type. Leads from cabinet to motor must be lead incased, in approved metal conduit inclosed in concrete if underground and dry; if damp, vitrified tile ducts in concrete should be used. Size of conductors in B & S gauges are determined for direct-current motors of respective sizes in horsepower and voltages on the basis of 90 per cent efficiency and 50 per cent overload. Size of conductors in B & S gauge is determined for alternating-current motors of respected sizes in horsepower and voltages on the basis of 90 per cent efficiency, 50 per cent overload and 85 per cent power-factor. All conduit is required to be supported independent of any woodwork. Motor terminals and conduit outlets must be properly waterproofed.

The Board requires a steel compression tank designed for at least 150 pounds working pressure and of about 2,000 gallons capacity in connection with the automatic starter. The location of the motor, control board and pump is subject to the approval of the Chicago Board of Underwriters.

The plant illustrated in Figs. 1, 2 and 3, the location of which has already been mentioned, is an interesting application of the terms of the specifications given in substance above. It should be explained that these specifications were drawn for centrifugal pumps. The pump in the installation in question is of that type. It may be seen at the left of the motor in Fig. 1. This machine, which was built by the Alberger Pump Company, has a capacity of 1,500 gallons of water a minute, at the normal speed of 1,200 revolutions per minute. It maintains a gauge pressure of 150 pounds per square inch throughout the piping system which it supplies with water. In addition to supplying the sprinkler system, the pump may be used to operate hose streams from the five hose connections shown in the figures. Thus

five high-pressure streams may be played on a fire through lines of hose run from the pump while the latter is, at the same time, pumping water into the sprinkler lines as fast as it is being discharged therefrom.

The pump in question is driven with a General Electric direct-current motor. This is a type DCL totally inclosed machine, with commutating poles and forced ventilation. One of the handholes which make the commutator accessible may be seen in right-hand end of the unit, at which end is also the intake of the air for keeping the motor cool during operation. The ventilating fan which draws the air through the motor is mounted on the shaft of this machine, at the end opposite the commutator, as the photographs show. Inclosing the motor in the manner indicated makes it not only dustproof but practically waterproof as well, while the system of ventilation employed is an effective safeguard against excessive heating. The interpoles are provided to insure sparkless operation of the commutator, of course.

This motor is started by means of the starter panel seen at the right of the motor in Fig. 2. This starter, which was built by the Cutler-Hammer Company, is arranged for either automatic starting or starting by hand. How automatic starting is accomplished may be made clear from a consideration of Fig. 3, which is a diagram of the starter connections. The pressure governor shown in the lower right-hand corner of the figure is in communication, by means of the proper sort of piping, with the sprinkler piping. The resulting drop in pressure when the sprinklers begin to discharge water operates a switch which closes an electric circuit between the

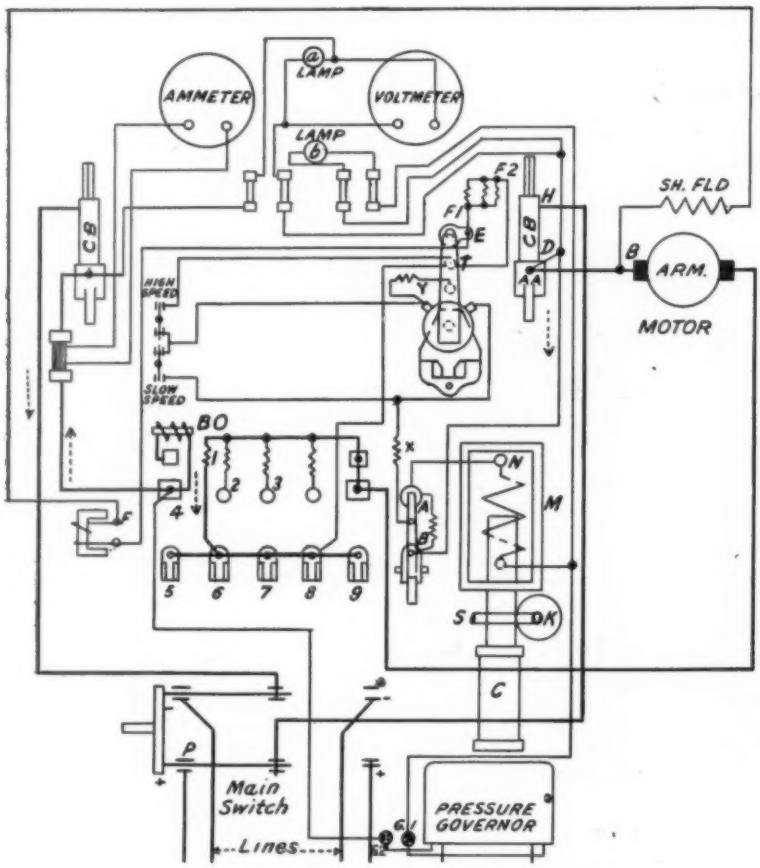


Fig. 3.—Wiring Diagram of Motor-Starting Board.

points G_1 and G_2 just to the left of the pressure governor. Current then flows from point P in the main switch to the solenoid M, the path of the current being P—H—AA—D—B—A—N—G_1—G_2 and over to the negative side of the line. The solenoid, or electromagnet, being thus energized, its core C is lifted slowly up, and as it rises, teeth on the side of it engage those of a cam K. This cam operates a shaft which closes a switch—not seen in Fig. 3—between points *5* and *4*, which action closes the armature circuit through the resistance *1*. Then the motor starts, the current flowing through the armature from AA and reaching the negative side of the line over a path which includes the left-hand circuit-breaker CB. As the core C rises further resistances *2*, *3*, and so on are put in multiple with resistance *1* and with each other, until C reaches the upper limit of its travel and cuts all the resistance out of the armature circuit. Then, of course, the motor reaches full speed.

The motor may be started by hand by means of a lever on the end of the shaft S which is easily seen in Fig. 2. The arrangement is such that the necessary time interval will elapse between successive resistance steps with manual starting as well as when the starting is automatic.

The inverse process of the one described above stops the motor when the pressure in the sprinkler lines and pressure governor has reached the normal predetermined value.

The path of the shunt-field current is from AA through the shunt field, and thence to the left and downward through the no-voltage release F, from which point it flows to E, and from E to T, and from T to *8*. Closing the push-button switch marked "High Speed" in Fig. 3 opens a switch between E and T and thus forces the shunt-field current to flow through resistance F_1 F_2 in passing from E to T. In this way the pump may be driven at a speed above that at which it is rated. To bring the motor back to normal speed, the button marked "Slow Speed" is pushed.

The magnet marked BO is a blowout coil which prevents the maintenance of arcs in the operation of the contactor switches which cut the armature into and out of circuit. AB is a resistance which is automatically thrown in series with the coil operating the core C as soon as the core reaches the limit of its upward travel. A switch opens between A and B and the current is thus caused to flow through the resistance, which reduces it to just the value needed to hold the core C without any danger of burning the solenoid. The resistance Y performs a similar function for the switch between E and T.

It will be noted that lamp *a* will burn as long as there is voltage at the main switch, while lamp *b* is lighted only while the switch between G_1 and G_2 is closed.

Only one of the field windings of the motor is shown—namely, the shunt field. The two circuit-breakers CB, near the top of the board are always kept set at some 200 per cent of the full-load current of the motor. It will be noted that power may be supplied to the board from either one of two sources by simply reversing the main switch, which is of the double-throw type.

This plant was recently tested under the supervision of F. G. Waldenfels and J. H. Brumbaugh, engineers for the Chicago Board of Underwriters, and was found to fulfill their requirements thoroughly. The pressure supplied is 50 pounds more than the Board required.

OUTDOOR WIRING FOR INCANDESCENT LAMPS.

By H. G. Wilson.

From the appearance of the different installations of lights for outside, summer-garden use, it would seem that each presents a problem of its own and has to be solved accordingly. The illustrations show the essential parts of a method used for this purpose, which, besides being in compliance with Code as much as is possible here, has a comparatively low cost to commend it.

Galvanized-iron messenger wires are stretched from eye bolts, bolted to the ring already referred to, to trees at the outer edge of the inclosure and fastened there by merely looping the wires around them, first passing the wiring through rubber hose for the reason as previously stated.

Fig. 2 shows the scheme used for the support of the wires and insulators. The hooks are made of $\frac{1}{16}$-in. by 1¼-in. strap iron. Holes are drilled in the lower end for the passage of bolts which hold securely the glass knobs on either side. These supports or knobs are spaced along the wires every 4.5 feet, to which they are fastened with tie wires.

By inserting pieces of heavy sheet iron, shaped and drilled as shown in Fig. 3, between the end insulators, means were provided for taking up the slack on the circuit wire by passing a tie wire through the remaining hole and then securing it to one of the eye bolts on the ring, and on the other end to a loop around the outside trees.

The weatherproof sockets were spaced 2 feet apart and as the circuits were suspended about 8 feet high, plenty of light was the result. In making the splices pains were taken to thoroughly tape and compound the joints so that, that trouble source was eliminated. Strain insulators and turnbuckles might have been inserted but so far that necessity has not been evident after four years use.

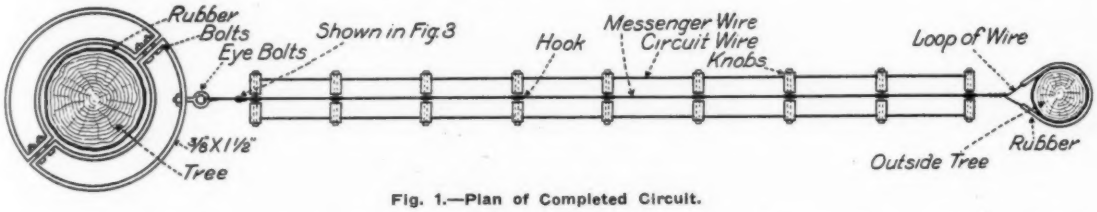


Fig. 1.—Plan of Completed Circuit.

This particular garden is circular in shape and is covered well with shade trees, among which are placed the benches, etc. A cutout cabinet large enough for one main knife switch and the required number of plug fuses for the protection of branch circuits, is fastened to a tree near the center of the garden. Care was exercised to make the cabinet as nearly weatherproof as possible by white leading all the joints, providing a slanting roof, painting, etc. The feed wires run up to the cabinet through conduit from connection with an underground system which supplies the numerous buildings in the vicinity.

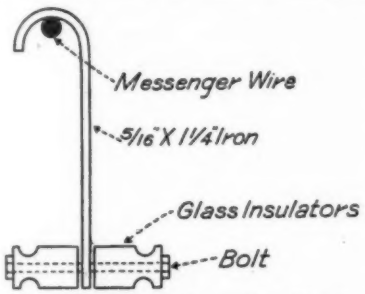


Fig. 2.—Method of Supporting Circuit Wires.

Between the cabinet and the first support for the wires, these are incased in flexible loom with the weather end carefully taped and compounded to exclude moisture.

Fig. 1 shows an iron ring fastened to the same tree the cabinet is fastened to, a strip of rubber being placed between it and the tree, to prevent damage thereto, and from here the circuits radiate to different and equally spaced sections of the park. One of these radiating circuits is shown in Fig. 1.

Among the Contractors.

Frazer & Bush, electrical contractors, of Lexington, have completed the new $10,000 electric light plant at Falmouth, Ky., for which they had the contract.

The Electrical Installation Company, 4315 North Winchester Street, Chicago, is wiring a large building for Nelson & Lewis, in Chicago.

The Pacific Electric Company, of Everett, Wash., is installing the wiring in the new vocational school in that city. Conduit work will be employed throughout, and the equipment will include the electric bells, clocks, etc.

The Cuthbert Electrical Manufacturing Company, 729 Fulton Street, Chicago, is installing the wiring for 1,000 incandescent lamps for Sears, Roebuck & Company, in this ity.

The Columbia Electric Company, of Seattle, has recently moved from 416 Union Street to larger quarters at 1019 Post Street, where greatly increased facilities in shop equipment have been made possible. Besides a general electrical contracting business the company, of which R. H. Walker is manager, manufacturers a line of electric fixtures.

The Evans-Dickson Company, of Tacoma, Wash., has been awarded the contract for the electrical work on Forts Casey and Flagler in the state of Washington. The work, which is to commence at once, will consist of transmission lines, pump house and meter installation, and the contract price will amount to about $20,000.

The Baker Electric Company, of Seattle, has recently been succeeded by the Parker Electric Company, with office at the same address—502 Washington Boulevard.

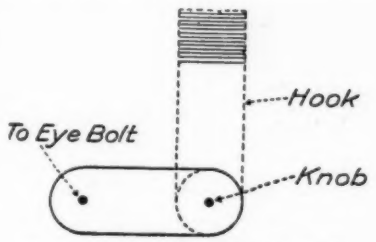


Fig. 3.—Device for Taking Up Slack.

The Emmons Electric Company, 118 North La Salle Street, Chicago, is installing the wiring for 700 incandescent lamps for A. R. McDonald, on Clifton Avenue, in this city.

Gustave R. Hartwig, who for eight years was connected with the Cascade Electric Fixture Company, of Seattle, Wash., has recently opened a place of business at 1331, Fourth Avenue, in that city, where an electrical contracting and supply business is conducted. Mr. Hartwig is a specialist on electric lighting and is devoting his attention largely to the lighting and fixture side of the business.

WIRING FOR POWER AND LIGHT IN PRINTING OFFICES.

Some Interesting Installations.

During the last year or two a great deal has been written concerning the advantages of electricity over other forms of energy for power and lights in the printing office. That these advantages are numerous and great would rarely be disputed now. Among them are the improvement made possible in flexibility and control of driven machinery, better daylight illumination, more effective and convenient artificial lighting, greater safety, better economy and so on. However, although, as just suggested, these advantages are rather generally recognized, there is by no means an adequate recognition, as a rule, of how much correct wiring in the printing office may contribute to the net advantages of the use of electricity there. If, for example distribution and control centers are not correctly designed and properly located, the elements of convenience and flexibility may be greatly reduced; poorly designed wiring may interfere with good lighting; and, to say nothing of the possible menace of poor wiring to property, the item of frequent and costly repairs on such work may seriously affect the ultimate economy of electric service. One does not have to visit many printing offices to be convinced that it is

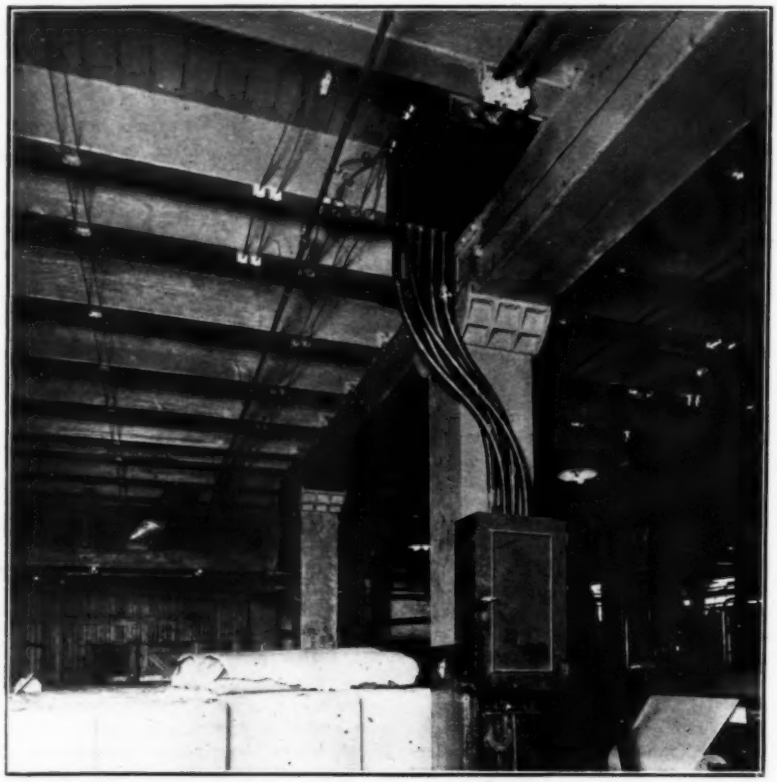


Fig. 2.—Distribution Center for Motor Circuits.—W. F. Hall Printing Company.

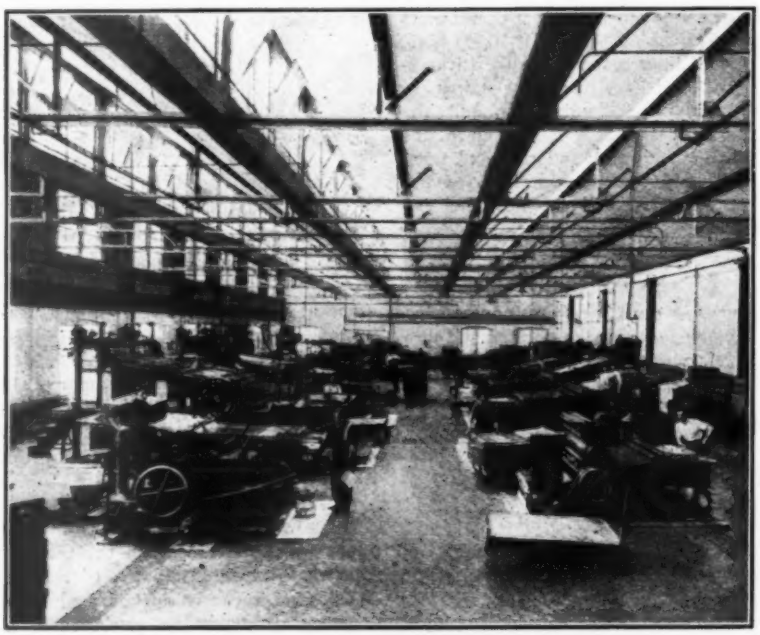


Fig. 1.—Press Room Where Concealed Conduit Work is Employed.

well worth while for electrical contractors to impress the importance of these matters on owners of such plants—particularly where plants are changing over to electricity from some other sort of drive, for it is here that the poorest wiring installation is usually found. Too often it is left to the electrical inspector to insist on construction of the right kind, and unfortunately his recommendations frequently come at a time when compliance with them involves changes in work already done which cannot be made without relatively great expense and annoyance.

In a large printing plant which an electrical inspector visited, in one of the Western states, not long ago it was found that the lighting feeder on the first floor had the main switch installed ahead of the fuse, the feeder entering the room as open wiring. The circuit then ran open to a distribution board not in a cabinet, the board being equipped with plug fuses. Conduit was run to the basement, where lighting circuits were run open on the joists. In the press room on the first floor the wiring was run open and concealed under canvas ceiling. There was also open wiring under lath and plaster in an office room, with a number of open runs from these circuits.

It is interesting to note the changes which were recommended in this work.

It was recommended, of course, that feeders should enter approved cabinets containing cutout and switch in conduit. It was also suggsted that from the distribution cabinet conduit should run to the basement and terminate there in the proper fitting. If open wiring was to be retained in the basement, it was required to be adequately protected with guard strips. Standard receptacles were required in the basement, and the use of long cords object-

ed to. For portable lamps reinforced portable cord was recommended, and it was requested that such lamps be provided with guards.

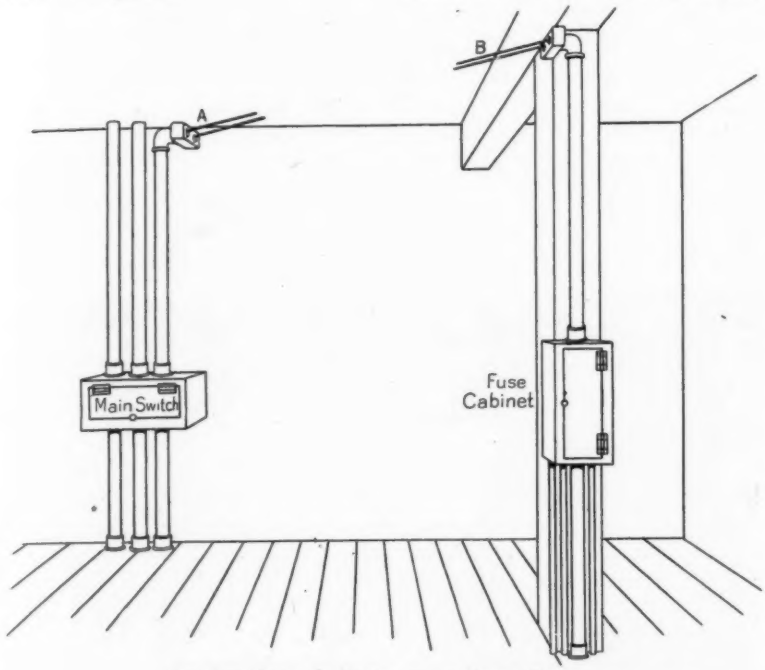


Fig. 3.—Wiring to Motors on an Upper Floor.

Approved cabinets were required for cutout panels on all floors, and it was insisted that circuits on side walls be made to consist of double-braid rubber-covered wires in iron conduits terminating in suitable condulet or outlet-box fittings. Flexible cords were required to hang free and not to come nearer the floor than 6.5 feet.

In this plant the main switches and fuses in the motor feeder circuits were not inclosed in cabinets of any sort, nor were switches and fuses for individual motors. Motor circuits of 500 volts pressure were run partly open, partly concealed and partly in molding. Other defects become apparent from a consideration of the changes in the wiring which the inspector suggested.

It was recommended that conduit feed should extend to approved cabinet containing main switch and cutout, from which point conduit should extend, without reduction in size of wire contained, and with double-braid rubber-covered wire in all cases, and with standard conduit fittings under floor with connections, to each first-floor motor. At convenient points near motors conduit should terminate in accessible cabinet containing fuses protecting the individual motor, this cabinet also preferably to contain motor switch. The conduit should run from this cabinet to the motor-starting rheostat, which should be in a metal cabinet complete except for the face, which was permitted to be left open. It was suggested that where feasible the rheostat might be installed in the fuse cabinet itself. From rheostats to motors conduit wiring was required, with proper terminal fittings near the motor, and where the rheostat grid was under a press the wiring between this grid and the rheostat terminal board must be run in conduit.

Fig. 4.—Lighting Feeders and Lighting Circuits in Basement.

It was requested that all overhead wires for motors be run in conduit, and that if the wire was smaller than No. 6, a separate cutout be installed whereever a motor feed left the main building feed.

All live parts, armatures and commutators of motors larger than one horsepower were required to be inclosed. For inclosing the motors, conical sheet-metal covers attached to the motor frame were recommended, these to be provided with openings covered with wire gauze for the proper ventilation of the motor.

In another plant examined by this inspector, conditions similar to those in the first installation were found, although, on the whole, the work was in better shape. It was necessary to insist upon the use here of reinforced portable cords for portable lamps, the use of either porcelain or composition sockets near machines mounted on floors, the rewiring of portions of the building in conduit, the placing of cutouts in cabinets, the installation of larger feeds for some of the motors, and the provision of inclosing covers for machines above one horsepower in capacity.

The two installations described above were doubtless put in with a view to saving money on the initial cost of the work rather than with any notion of securing really high-class construction. The notes on the electrical work in two other printing offices which are

found in the following paragraphs describe some better wiring for service of the kind under consideration.

Fig. 1 is a photograph of the press room in a printing plant where concealed conduit wiring is employed for the motors. Except the small job presses, every press in this large room is equipped with two direct-current motors, one of which is used to operate the automatic feeder and the other to drive the press itself. The branch circuits for the motors are run in the floor from the motor feeders to the machine-switch and fuse cabinets, which are located near the motors they control. As far as possible, the rest of the circuit, in the case of each machine, is also placed within the floor. In wiring to motor-control stations and lights on the presses flexible conduit is employed wherever a neat job could not be made with rigid tubing. The absence of visible wiring in the room is conspicuous. As the photograph shows, this contributes greatly to the good appearance and good illumination of the room. Moreover, it is very important in promoting the convenience of operatives working around the presses.

This is practically a new building, and the wiring was installed, when the building was erected.

With no exceptions that are recalled now, conduit wiring is eminently the best type of construction for printing offices. Where an old building is to be wired for the operation of printing machinery, exposed conduit work can often be employed to advantage.

One of the largest and best equipped printing plants in the country is that of the W. F. Hall Printing Company, of Chicago, portions of the electrical work in which are shown in the accompanying photographs. The motor installation here includes about 255 machines, the aggregate horsepower of these being approximately 800. The plant is lighted with electricity throughout, both incandescent and Cooper Hewitt lamps being used. Direct-current power is employed altogether, which is furnished by the Commonwealth Edison Company. The electric wiring consists of exposed conduit and open work, and possesses many features of special interest to those engaged in electrical construction.

The building, which is 330 feet long and 130 feet in width, really consists of two adjoining buildings, these being known as Building *A* and Building *B*. Since the wiring in the two is essentially the same, only that part of it in Building *B* will be described here.

The three-wire 110-220-volt service is brought in to a switchboard in the basement of Building *A*, this board being equipped with the necessary complement of demand indicators and wattmeters. Panels for feeders to the motors and lights in this building are likewise included in this board. There also extends from the board a run of heavy feeders in exposed conduits which supply energy to a similar board in the basement of Building *B*, from which all feeders to branch circuits in this building are run. Both switchboards are of marble and are completely fenced off with well designed iron wicker-work inclosures, having gates which are kept locked. This prevents objects from being piled against the boards, of course, and eliminates the possibility of irresponsible persons coming in contact with live metal parts.

Fig. 4 is a photograph taken in the basement of Building *B*. The large conduit extending upward and to the right from the cutout cabinet seen in the picture receives, through a Type A condulet, the three-wire feeders from the switchboard which supply current to the lights in this building. From this cabinet upward there extends a two-inch conduit which runs through to the top floor of the building. This pipe contains the three-wire lighting feeders for all the rooms. On each floor it passes through a cutout cabinet similar to the one shown in Fig. 2, which cabinet serves as a distributing point for the branch lighting circuits on that floor.

The method of bringing these branch circuits out from the cutout cabinets is the same in all cases, and it is well shown in Fig. 4. Each two-wire circuit is brought out of the cabinet in a three-quarter-inch conduit, which is run all the way up to the ceiling and enters a junction box there. Knockouts are removed from the sides of these boxes and porcelain bushings inserted, through which the wires are brought out in loom, the loom being extended to the first cleat. This generous use of conduit and fittings for the protection of wires on side walls is a decided improvement over the sort of protection provided in the average installation of wiring of this type.

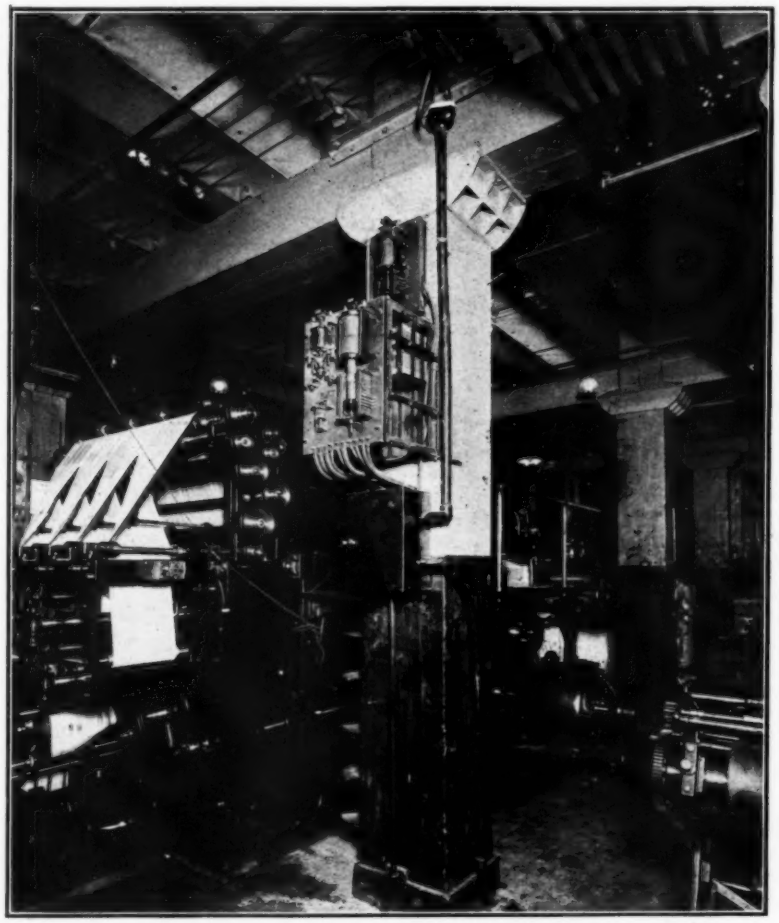


Fig. 5.—Circuits to Press and Motor in Basement.

Fig. 4 is a photograph of the cutout cabinet and vertical risers in the lighting system in the basement. All branch lighting circuits are fused in the cabinets with Edison plug fuses and rotary snap switches. These branch circuits are run open, on cleats.

Parts of the power wiring in the building in question are illustrated in Figs. 2, 3 and 5. Vertical risers are run in conduit from the main switchboard to the top floor. On each floor these pass through a sheet-metal cabinet, such as is illustrated in Fig. 3. A properly fused knife switch is installed in the cabinet, through which the feeder for the motors on that floor are taken off from the vertical risers. The feeder is run to the ceiling in conduit as shown in Fig. 3, and equipped there with a condulet fitting. From this fitting the motor feeders run open as from *A* to *B* in Fig. 5—to that one of the vertical columns supporting the ceiling which is most conveniently located for a distribution panel. The feeders enter the distribution panel through a conduit extending to the ceiling, as shown in the figure. From the cabinet the circuits for the individual motors on this floor run through conduit to a branch-box on the ceiling of the room below. From here the circuits radiate, running on the ceiling to points underneath the cabinets containing the individual motor switches. It is to be noted that the fuse cabinet on the floor above—see Fig. 3—does not contain switches. The motor circuits then run upward in conduit to the switch. From motor switch to motor the wiring is in conduit, except where a small amount of loom is used at the starting rheostat.

For motors in the basement the circuits are run on the ceiling to points over the machine switches. Figs. 2 and 5 are portions of the motor wiring for presses in the basement. Fig. 2 is the distributing center for the motor circuits, while Fig. 5 shows the construction around a motor and the press it drives.

When a starting rheostat is mounted on a vertical wooden column in this plant, two 2-by-4-inch timbers are bolted to the column and the rheostat fastened to these by means of bolts passing through pieces of porcelain placed between the iron and the wood. An asbestos screen is then placed between the rheostat and its supporting screen. In case the rheostat is mounted on a brick wall, as is true with some small motors in the carpenter shop, there is first a sheet of asbestos, then the 2-by-4-inch timbers, then blocks of porcelain, and finally the rheostat.

Throughout the entire plant of the Hall Company the methods indicated above have been employed in laying out and installing the wiring and the circuit accessories. As a whole, the installation is certainly much superior to the kind of work ordinarly found in printing offices. The wiring was done by Kohler Brothers, of Chicago, whose system of control is used.

R. C. Bierdemann.

During the last year or two a great deal has been said about the necessity of hearty co-operation among men engaged in the electrical-contracting business. And most of what has been said has been timely and appropriate. It is much easier, however, to indulge in generalities concerning the benefits of co-operation than to deduce practical plans for insuring concerted effort among men engaged in the business. That effective means for nation-wide co-operation have finally been evolved the present position of dignity and power of the National Electrical Contractors' Association is sure evidence. In addition to the prominent and influential part which they take in the affairs of the association just mentioned, the contractors of Chicago have built up two organizations which are striking examples of the proper spirit of mutuality and unified effort among local members of the craft. These are the Chicago Electrical Contractors' Association, and the Faraday Electrical Association. Of the latter body R. C. Bierdemann was a leader in the organization; he was its first president, and is now the chairman of the Board of Directors.

"Two years ago," says Mr. Bierdemann," there were about ten contractors out on the North Side in Chicago, and we were constantly and persistently engaged in the cheerless occupation of 'cutting each others' throats, in a business way. Fortunately we finally came to realize the folly of this procedure, and we came together in the association just mentioned. Other contractors soon joined us, and we now have a most satisfactory association, with convenient headquarters down town and an efficient secretary who devotes his entire time to association affairs."

Mr. Bierdemann has also been very active in the National and the State associations. He is a director in both bodies, and a delegate from Illinois to the Denver convention.

Born in Chicago in 1880, Mr. Bierdemann began his business life as a law student. This proved distasteful to him, and he left it and entered the employ of the Western Electric Company, in the electrical construction department. In 1904 he left this company, and ever since then has been in business for himself as an electrical contractor.

He is a Mason, is past president of Geneva Council No. 90, National Union, and is prominent in other fraternal organizations. He knows electrical construction and electrical contracting, and is an all round good fellow. His photograph appears on page 54 of this issue.

Special Lighting for Moving-Picture Theaters.

The effect produced upon an audience at a moving-picture show when a glare of light is suddenly thrust into the line of vision is anything else than pleasing, and therefore not conducive to a desire on the part of people thus afflicted to frequent a place where this occurs. Moreover, microbes may reasonably be expected to increase and multiply beneath the seats of moving-picture houses where there is not the proper sort of illumination to insure that the floor will at all times be kept fairly clean.

The installation of low-candle-power lamps beneath the seats in theaters of the kind in question would greatly promote comfort, convenience and cleanliness. The light would not interfere with the pictures, and people could see how to come and go without the necessity of other lights being turned on, and without stepping on the feet of others. It would also be a strong incentive to cleanliness. "Out of sight" and "out of mind" are synonymous terms in the ordinary code of sanitation. Let the floor be lighted in the manner suggested, and microbes will vanish, for both managers and scrub women have eyes. And then, too, it is not ethical to spit where the filthy effect produced is readily discernible.

G. W. Barlow.

Why Not Use A Standard Inclosed Fuse?

Having some open fuses of large capacity, we thought it advisable to inclose them in some way in order to avoid the flame and noise incident to their blowing. Some asbestos card was at hand, and the fuses were wrapped with a couple of layers of this. The result was entirely satisfactory, the fuses blowing with little or no disturbance. The blowing point of the fuses was probably lowered but apparently not enough to amount to anything.

S. E. Moore.

Student Branches of American Society of Mechanical Engineers.

Since the inauguration of the policy of forming student branches at the leading technical colleges and universities, which was begun less than four years ago, 25 such branches of the American Society of Mechanical Engineers have been organized in this country.

During the period from 1901 to 1910 the number of fires in the city of Chicago increased 487 per cent, while the number due to electrical causes decreased 40 per cent. The number of lamps in use was more than tripled during this period.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Saving Time in Heating the Soldering Iron.

Electricians frequently lose much time in adjusting the soldering iron to the flame when one is to be heated. A convenient way of overcoming this waste is to provide the iron with a washer as shown in the figure, of the proper size to fit into a hollow sheet-

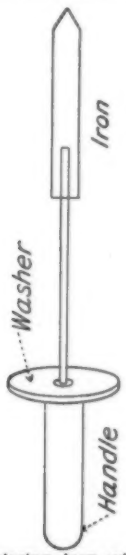


Fig. 1.—Soldering Iron with Washer.

iron cylinder around the flame. The soldering iron can then be dropped into the cylinder or pot and the washer caught by a stop arranged in the proper place to hold the iron in the flame correctly.

H. G. Wilson.

Convenient Control for Closet Light.

In closets used as places for hanging up clothing or for other similar purposes it is quite convenient to have the lamp arranged so that the light will be turned on automatically whenever the door is opened, and kept on until the door is shut again. I saw an arrangement of this sort in a hotel room recently. The lamp was controlled by means of a switch set in the frame of the door where the shutter swung. While the door remained closed, the edge of the shutter pressed against a rod arranged to control a push-button switch. When the door was opened, however, a spring in the switch caused the latter to close automatically and turn on the light.

L. G. Obermeyer.

A Convenient Tool for Motor Winding.

I went to a factory to assist the factory electrician in some rush work on a

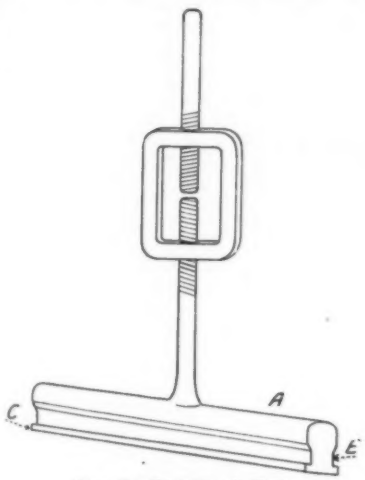


Fig. 2.—Details of Tool.

motor, and he had a device for crowding the conductors into the slots of the stator that is fine. It is here roughly illustrated. *A* is the length of the stator slots, and the neck *B* is small enough to enter the slots, while the flat bottom *C* is about the width of the bottom of the slots. The handle has a left-hand thread on it, and it and a rod having right-hand threads on it enter a ring, forming a turn-buckle. With a small block for the apparatus to push against,

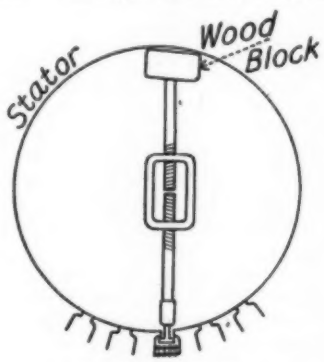


Fig. 3.—Tool in Use.

as shown in Fig. 3, the windings are crowded smoothly and evenly and without damage into the slot.

C. W. Goddard.

Testing for Kind of Current.

Perhaps some of your readers may find the following useful as I have done. A simple way to determine whether a circuit on which arc lamps are used is alternating or direct current is this: Wave your hand with fingers outstretched between the lamp and the eyes, and if the current is direct the fingers will look normal; while the light of an alternating-current lamp will make the number of fingers appear to be multiplied several times, giving the appearance of a large number. This works best ten or fifteen feet from the lamp.

H. Piccard.

Ammeter Connection for Testing Board.

Not long ago I had to work out a scheme for connecting an ammeter on a meter-testing board in such a way that it could be shifted to either outside wire of an Edison three-wire system, at will, without open circuiting the other outside wire or causing a short-circuit. The ammeter was connected as shown in the accompanying figure.

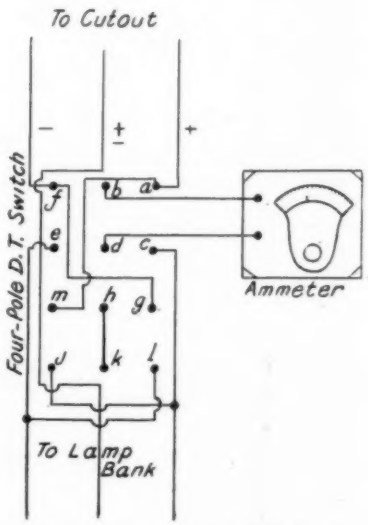


Fig. 4.—Diagram of Connections.

A four-blade, double-throw knife switch was used. Let it be assumed that the right-hand outside wire is the positive one. By throwing the switch to the right, points *b a, d c, g h,* and *k l* are connected, and the path of the current is *a-b*, then through the ammeter, and from here by way of *d-c* to the lamp bank. Thence it goes over the path *l-k-h-g-f* to the negative side of the circuit. From a similar study of the figure, it may be seen how the circuit is made when the switch is thrown to the left, thus connecting points *b* and *f*, *d* and *e*, *h* and *m*, and *k* and *j*.

Henry Milligan.

The number of motors inspected by the city inspectors of Chicago during 1911 was 21,752 with an aggregate horsepower of 170,087.

National Electrical Inspectors' Association

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Secretary's Message.

The following changes in addresses should be made on the list:

Emil Anderson, to 1236 Plymouth Building, Minneapolis, Minn.

Herbert Elder, to 278 Herr Avenue, Harrisburg, Pa.

Fred G. Hartwell, to 15 Westbourne Street, Roslindale, Mass.

Hugh T. Wreaks, John W. Goetsch, and R. L. Shearer, to 80 Maiden Lane, New York City.

The proposal has been made and approved by the Executive Committee that the name of the Association be changed so as to read, "National Association of Electrical Inspectors." Each member of the Association has the opportunity to forward to the Secretary his vote as to the desirability of the change, which is practically a grammatical one, and the Secretary trusts that he may be favored with some responses. And in this connection he may say that after July 8 and until September 15 his address will be, W. Lincoln Smith, Katahdin Iron Works, Maine.

The most interesting question, as may be readily seen from the answers, which appears this month is No. 186. The Secretary made some inquiries after this question came in and received the following reply.

"We beg to thank you for your full and courteous letter. In reference to what the conditions are here, we beg to say that our City adopts the Code as a whole and our Inspector claims that as the List of Fittings is a supplement to the Code and the correct interpretation of the same, that he has no right even to consider a fixture that is not made by an approved manufacturer. We claim that he has to enforce this to the letter or let each fixture stand on its own merits, which we want him to do. . . . . "

Now, in connection with this question, there are some pretty important things to consider, and first of all what is a "fixture." The Century dictionary says "any appendage or part of the furniture of a house which is affixed to it with nails or screws, as a gas-fixture." Legally it is a personal chattel which when attached to the realty becomes such a part of it as thereafter to be considered as realty rather than personality. Thus it is usual in the sale of a house to specifically except the gas and electric fixtures; otherwise they could not be retained by the seller but would belong to the purchaser.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association: it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Obviously the definition of the Century dictionary is not what is meant here, and it has always seemed to me that the word "fixture" as used here meant such a mechanism for supporting lights, shades, and other illuminating appliances, as combined with artistic design that care in construction and skill of workmanship which easily differentiates it from the simple mechanical support and protecting arrangement which any wireman who knows how to cut a thread and avoid fins and burrs can put together on the spot. It would seem to me ridiculous, for instance, to claim that a brass pipe screwed to the nipple of a condulet fitting and having on its lower end a socket became such a device as must bear the name and trademark of its maker.

Again, what is the "Approved List?" I take it that it is simply a list of manufacturers who have submitted samples of their wares to a semiprivate organization, and, after testing, have received a certificate that their goods have come up to certain standards of excellence which good engineering skill, combined with horse sense in not aiming at impossibilities has decided are requisite in the present state of the art for such wares. But certainly no public authority has conferred upon the Laboratories the kind of control and authority which the Bureau charged with the execution of the Pure Food Law has, for instance. The authority of the Laboratories rests upon the common sense of the electrical fraternity, upon the obvious value of having a testing laboratory with unbiased engineers, and the appreciation on the part of all that its work is honest and efficient and its results reliable. And this I believe is a far firmer and securer foundation than many of the other kind, at least as laws are looked upon by many of our people today.

We find, then, two things: first, a list of the requirements the various fittings must meet in order to attain that degree of excellence which entitles them to be used by workmen who wish to do as good work as the state of the art allows; and second, a list of men who on the word of the Laboratories are furnishing such fittings.

We must, however, recognize that occasionally there are things which have to be tried out in the field and not only in the Laboratories, and such things as these are used without being on the approved list.

It was so with the Condulet and similar type fittings; there was quite a time when these were being permitted by inspection departments although not on the approved list, because it was realized that beyond a laboratory test it was necessary that they be tried out

in the field to see if they made good there.

Now there are many cases where the necessary tests are too technical for the average man—the full set of tests for the new-Code wire, for instance—as well as requiring too much time, and, consequently, we are very glad to be able to look for the tag on an unbroken coil, or the marker in the braid, and in case of doubt try the stretch of a sample of insulation, and take the rest on faith. There are other things where this is not so. Take wooden cabinets, for instance; in the approved list there is no separation of material of cabinets, and under Rule 70 we find the requirement that all cabinets must be marked with the manufacturer's name so it can be seen when installed.

Suppose you take the case of a house where the cabinet is being built in according to the architect's drawing by the carpenter. The inspector sees that it fulfils the requirements of Rule 70, but it would be silly to say that the carpenter who made it must put his name on it so it can be seen by every one after the house is done.

It appears to me that the true way of regarding the List of Approved Fittings is as a ready reference list of makers of apparatus whose goods can be trusted as being up to standard, with a reasonable degree of certainty, the word reasonable being used because some fault may have occurred in the particular batch of goods, and the quality have fallen off since the last list came out—or, as may be the case with some of the new-Code wire for all we know, a year or more of use may show that the material is weak from the point of view of useful life; and which, therefore, the Inspector can accept on faith. Looked at thus, the maker's name and trade mark are a necessity, obviously. On the other hand, one has in Class D of the Code a schedule of the requirements to be met, and if some one wants to use a device which is not on the approved list, the Inspector may test it himself to see if it meets these requirements, if not too difficult and time consuming, or he may send it to the Laboratories and have it tested, and if it does not come up to the scratch he may refuse to accept it; but if it does I can not for the life of me see how he can justify his refusal to accept it.

I may be entirely wrong in my ideas on this matter but it seems to me the only equitable and reasonable way of looking at it and I hope that, if I am in error, some of the members of the Association will send me some information which I can use in this column not only for my own but for others' advantage as well.

Concerning Approved Fixtures.

Question 186.—*a*. If a fixture is made to meet all the requirements of the Code, except Rule 77e, would the same be passed if installed? *b*. Can an approved fixture be shortened or changed in any way at all? *c*. Is a three-eighths-inch socket on a piece of three-eighths-inch brass pipe a "fixture," and if so will it have to be made by an approved manufacturer?

Answer 1.—*a*. All devices and materials should bear the manufacturer's trade mark or name.

b. We can see no objections to the shortening of approved fixtures, but might have some objections to approved fixtures being changed in other ways.

c. We consider the above described as a fixture, but would not necessarily require that it be approved by the Laboratories or bear their label of approval in order to accept same.

Answer 2. *a*. Rule 77, to which this question refers, is mandatory, "must be marked," etc.

b. I don't suppose the Code requirements contemplate any particular length of stem in a fixture with the other parts about it approved, and I see no reason why it should not be shortened to meet the convenience of the owner.

c. I should say no, and that a few fixtures arranged as indicated to meet an emergency might be approved. I should not care to approve such construction in a large way.

Answer 3.—*a*. If your questioner means to ask "Should such a fixture be passed?", I will answer no. Whether it would be passed or not depends entirely on how strictly the inspector was adhering to his Code. In my judgment this requirement calling for a satisfactory and permanent means of identification is an excellent one, und should tend to maintain or to improve the quality of the manufactured article.

b. If the inspection department having jurisdiction is in the habit of accepting approved fixtures without inspection, no change whatever should be made in such approved fixtures without notice to and subsequent examination by said department. Otherwise a decided injustice is done the original manufacturer.

c. Yes. I should rule that a three-eighths-inch socket on the end of a piece of three-eighths-inch brass pipe is a fixture, and is subject to all the requirements of Rule 77. But I have never found anything in the National Code about an "approved manufacturer," or anything prohibiting the use of fittings that meet the constructional requirements of the Code, no matter by whom the fittings are made.

Answer 4.—*a*. Acceptance would depend upon whether or not the inspector held strictly to the letter of the law. If he required that the fixture be absolutely Code standard, it would, of course, be necessary to have the manufacturer's name or trade mark upon it.

b. Yes, if done in such a way that the remodeled fixture meets all requirements of the Code.

c. Yes, strictly speaking.

Answer 5.—The several questions contained in this question are somewhat ethical and open an opportunity for serious disagreement in the application of the Code. The Code is either right or wrong, and, according to the present rule, within the Code, any inspection department applying the Code, in the letter, would, I think, answer as follows: *a*, no; *b*, yes; *c*, yes.

The intent of the Code, that of eliminating possible and existing fire hazards, would suggest, if the fixtures were properly made and installed, a much different answer, however.

Answer 6.—*a*. Yes, under general conditions, as the general practice is for fixture manufacturers to install their own fixtures, and in some cases handsome and elaborate fixtures would be marred by any very distinctive marking.

b. Yes, by a competent mechanic.

c. No, this would be termed a "rigid pendant."

Answer 7.—*a*. The answers to these questions relating to fixture work would be determined by the policy of the inspection department in reference to fixture inspections, with the exception of the third question (*c*) to which the answer is undoubtedly Yes. Not only a three-eighths-inch socket, but any socket whether attached to a pipe or not, must be considered a fixture, since the Code contains no definition of the term "fixture." I do not think it is wise or practical at this time for an inspection department to take the position that all fixtures to be accepted must be labeled or listed. A fixture may be almost any form of support for lamp sockets or receptacles—ranging from an extensive conduit system to a simple socket. Should an inspection department refuse to accept any but listed fixtures, in order to be consistent, criticism would have to be made of any lamp socket secured to an outlet box or on a crow-foot, and many other commonly used methods of mounting sockets or receptacles; such a ruling would be absurd and the position of the inspection department would be

untenable. The only wise and practicable course at the present time would seem to be a sharp distinction between labeled or approved fixtures and unlisted fixtures, the former being accepted without necessarily being examined except as to their method of installation, and the latter being inspected thoroughly with a view of detecting any violations of Rule 77 in their construction. Should any violation of Rule 77 be found on a labeled or listed fixture, the proper course would be to take up the matter with the manufacturers through the Laboratories and secure proper adjustment through this channel rather than through the contractor or his customer.

Answer 8.—*a*. We have not yet begun to require the placing of the manufacturer's name on a fixture. The rules undoubtedly call for this, however, and as soon as the business has adjusted itself to the new rules generally, we shall insist upon compliance with Rule 77*e*.

b. There would appear to be no good reason to prevent the shortening or changing of an approved fixture provided it be inspected and passed as a repair or alteration job in the same way that changes to other portions of the equipment are now handled.

c. If a manufacturer should ask to have a fixture consisting of a three-eighths-inch socket on a three-eighths-inch brass pipe classed as a fixture, there would appear to be no ground for refusing him. On the other hand, if a contractor desired to assemble such a device on the job, we could hardly require him to secure a factory label or place his trade mark on the stem, although his work would naturally be inspected as to compliance with the other requirements of Rule 77.

Answer 9.—*a*. It unquestionably would in this jurisdiction.

b. Yes, it is frequently necessary; as where a stock-size fixture is ordered for a job, or certain stock sizes carried by a contractor, and when he reaches the installation, he finds a ceiling partially furred down, so the two or more fixtures in the same room must have stems of different length.

c. No I do not consider it a fixture but a rigid pendant. Further, I do not know what is an "approved manufacturer."

Mounting of Auto-Starters.

Question 187. Should an auto-starter when mounted on a non-fireproof support (wall or floor) be protected with a slate or other non-combustible backing? The particular case in question is a 550-volt, three-phase induction-motor installation.

Answer 1. Auto-starters of the resistance type should comply with the requirements for rheostats and starting boxes with respect to mounting. Where starters are of the compensating or induction type with coils submerged in oil or contained in heavy cast-iron cases, we do not believe this suggestion necessary.

Answer 2. Rule 4, paragraph *a*, provides that the resistance boxes must be at least one foot from combustible material, unless mounted on a slab of slate, soapstone or marble.

Answer 3. No, not necessarily. See Code Rule 8*d*, first paragraph, and its reference.

Answer 4. There is no rule covering this point; therefore the inspector cannot require the backing unless he has authority to go beyond the Code.

Answer 5. If there are intermediate places at which the lever or switch, other than the starting, running or stopping points, could be placed, then it should be mounted on either slate or marble or their equivalent.

Answer 6. No, but on account of life hazard it would be preferable to treat same as a transformer, and permanently and effectively ground the case of same.

Answer 7. An auto-starter is not a resistance and therefore Rule 4*a* is not applicable. Specific rules for auto-starters are included in Rule 8*d*.

Answer 8. It is not necessary to provide a non-combustible backing for an ordinary auto-starter. If the device in question employs sufficient resistance to produce an objectionable amount of heat, it must be classed as a rheostat rather than as an auto-starter. (See second paragraph of Rule 79.)

Answer 9. I should say that in so far as possible the auto-starter should be treated like a transformer. It is not subject to rheostat requirements. If it has exposed contacts, it must be carefully protected. It should have its case grounded, and if oil-filled should be arranged so that any heat development will not cause expanding oil to cause any dangerous condition.

Installing Inclosed Rheostat on Combustible Supports.

Question 188. A standard motor-starting rheostat is inclosed in an approved No. 16 gauge steel cabinet, mounted on a wooden partition. Should this installation be approved without the slate slab (or one of marble or similar material), called for under Rule 4-*a*?

Answer 1. Rheostat as described should be mounted on a slate or marble slab, as this means of supporting prevents the radiation of heat generated in rheostat to the combustible material in the partition. The 16-gauge steel cabinet affords very little resistance to the radiation of heat.

Answer 2. I should say the construction described in this question meets the requirements of the rule.

Answer 3. No. The interposition of a one-sixteenth-inch thickness of metal —which is an excellent conductor of heat — presumably placed directly against the wooden partition, would be little protection against the transmission of heat to the wood. We should require the slate mounting with the cabinet as well as without.

Answer 4. No. The steel cabinet would not prevent the heat due to burning out of coils from charring or setting fire to the wood.

Answer 5. The rheostat should be mounted on slate or marble, or their equivalent.

Answer 6. No.

Answer 7. A starting rheostat is treated by the Code as a source of heat and the back of a steel cabinet between the rheostat and combustible material is not suitable protection, nor is the rheostat, mounted as required, separated from combustible material as required under Rule 4-*a*.

Answer 8. No.

Answer 9. No. There should in addition be a thickness of slate or asbestos board or similar material, unless the rheostat is separated from the cabinet by a reasonable air space and the cabinet so ventilated as to prevent radiation of heat through the same to the wooden partition.

Outing of the Cleveland Electrical League.

On July 16, the Electrical League of Cleveland is to have a picnic at Cedar Point, O. The steamer *Eastland* will convey the party by water, leaving Cleveland at 8:45 a. m. The Ohio Electric Light Association will be in convention at Cedar Point, the first session of the convention being held upon that day.

R. G. Pate is chairman of the committee which is arranging for this excursion.

Commercial Practice
Management, Rates, New Business

THE COOKING LOAD FROM THE SUPPLY POINT OF VIEW.[1]

By F. M. Long.

The application of electrical energy for cooking and kindred purposes is now engaging the attention of those in charge of central stations, and the object of this paper is to consider the new demand arising therefrom and what effect it will have on such undertakings.

There can be no doubt that there are great possibilities in electric cooking. It is able to offer all the conveniences and advantages which have made gas so successful, and in addition there are so many other advantages, in the absence of smell, greater cleanliness and better results, that it would seem that it is only necessary now that suitable apparatus should be provided and current supplied at a sufficiently low rate in order to insure its extensive use.

The cost of supply involves an investigation into the character of the load, that is to say, the maximum demand it will produce at the station, its duration, and the time of the day at which it will occur.

In order, however, to arrive at any conclusion it is necessary first of all to settle on some basis of cost of supply, and for this purpose the expenses are divided into standing costs and running costs.

For the majority of existing stations there is a standing cost of $50 to $75 per kilowatt, and a running cost of less than two cents per unit.

The standing costs in most stations are made up to a large extent of capital charges covering expenditure on plant, part of which was put down many years ago at a cost per kilowatt perhaps three or four times that at which the plant can be purchased today, and the author thinks that most engineers will agree with him that it would be unreasonable and unnecessary to saddle a new load with a proportion of such charges which were incurred for the lighting load, and which the lighting load is well able to bear.

The true cost of meeting an additional load is the cost in respect of the new plant and mains required for such load, and this may be arrived at in any particular case by making an estimate of the outlay which would be necessary. It will vary in individual cases according to circumstances.

In order to treat the matter on general lines the author has taken the increase in the standing costs during the past five years and divided this by the increase in the maximum load, and he finds that for the majority of stations this works out at a figure between $15 and $25 per kilowatt; there seems therefore no doubt that the capacity of any station can be increased within these limits, and it is probable that the figure will be less in the future than it has been in the past. $4 per kilowatt will be assumed.

The running costs per unit vary very much, from about 0.4 cent in large stations and where coal is cheap, to 1.2 cents for small stations with dear coal. 0.6 cent is assumed in what follows.

The Character of a Cooking Load.

It is obvious that this must vary in different localities according to the prevailing habits of the community.

The different classes of load comprising the total load on a station fall generally under three headings, as follows: (1) Small and medium houses where the principal meal is at midday. (2) Large and medium houses where the dinner is in the evening. (3) Hotels, restaurants, luncheon and tea-rooms, etc., where the load is spread fairly evenly over a number of hours.

In the first class,[2] which will form the majority in small towns when electric cooking is well established, the principal features will be a considerable demand between 7 and 9 a. m. for breakfast, and a rather larger and longer demand from 10.00 rising to a maximum at 1 o'clock. There will also be some demand, probably all day, due principally to water heating and boiling kettles, but this will be intermittent in individual houses though producing a fairly steady load at the station.

The magnitude of the load resulting from a cooking demand is important from the supply point of view. It is obvious that it will never be anything like equal to the maximum installed. It is hardly ever necessary to use the full capacity of the cooker, and the average is probably less than half; moreover, only a proportion of the apparatus is in service at any one time.

Mr. Street informs the author that at Southampton he finds that cooking apparatus produces, in the morning, a load of 20 to 25 per cent of the maximum installed and it is probable that 25 per cent is as much as need be allowed for.

The load coming on in the morning only involves the running cost of supply, but with this class of consumer there is the load in the evening due to boiling water for teas, etc., which, though small, must be taken into account as it affects the standing costs. In individual houses it may be taken at about 20 to 25 per cent of the maximum installed, but as the diversity-factor is high, probably 5 per cent would be ample to allow for the load produced on the station.

To reduce the cost per kilowatt to an average cost per unit it is necessary to know approximately the annual consumption per kilowatt. For the present this may be taken at 400 units per kilowatt installed and the standing costs based on the above assumption of $20 per kilowatt will be:

5 per cent of $20 divided by 400 ..... 0.24 cent
Which, added to the running cost 0.60

Gives 0.84

as the total of this class of supply, excluding any special cost for distributing mains and services which will be dealt with later.

Houses where the Principal Meal is in the Evening.

Working on the same lines as above we should have a load assumed to be 25 per cent of the maximum installed occurring in the evening, and the cost would be:

Standing costs, 25 per cent of $20 divided by 400..... 1.20 cents
Running costs 0.60

Total 1.80

This is on the assumption that the cooking apparatus is used all the year round, but as this is not the case with gas cookers it is not likely to occur with electrical cookers.

In houses where late dinner is the rule, the kitchen range would, in the majority of cases, be used in the winter and it would be quite safe to assume that only half of the total

1 Paper read at convention of Incorporated Municipal Electrical Association, Harrogate, England, June, 1912; abridged.

number of electric cookers would be in use in the winter months giving a load at peak time of 12.5 per cent of the maximum installed, but in this case the units used would not be so much. Assuming 300 only instead of 400 per annum per kilowatt installed we should have:

Standing costs, 12.5 per cent of $20 divided by 300	$0.80
Running costs	0.60
Total	$1.40

Hotels and Restaurants.

The author has not been able to obtain any particulars of electric cookers used in hotels, but it is probable that they would prove from the station point of view rather cheaper to supply than late-dinner houses as the consumption would be spread over longer hours, but they would be in use on the peak and would probably cost more to supply than early-dinner houses. Restaurants should form a very useful load as the demand would be more or less continuous.

This class generally will produce a load somewhat similar to a motor load with a load-factor of probably 30 per cent, and the cost of supply would be:

Standing costs	0.78 cent
Running costs	0.60
Total	1.38

Services and Distributing Mains.

The question of what additional expense would be involved on account of services and mains is one that naturally occurs to an engineer, and the first impression is that this will be a serious obstacle to electric cooking, but investigation and experience so far as it goes at present, seem to show that this is probably overrated.

In all the central and industrial portions of a town the distributing mains will generally be large enough to carry without addition, a cooking load which in such parts will be small as compared with the general demand for lighting and power, or if additions are required the cost will not be abnormal in proportion to the revenue derived; but in residential areas where the density of load is very much less, and the cost of mains in proportion to revenue derived is much greater, the case may be different. To arrive at any conclusion it is necessary to estimate what the cooking load is likely to amount to, in proportion to the lighting load.

For small houses, with say, 10 to 15 lamps installed, the average lighting load may be taken at 150 watts per house and for such houses a small cooking outfit consuming as a maximum 2,000 watts would be sufficient. Assuming for some years to come that half the number of houses lighted had electric cookers and also, as earlier in this paper, that the average maximum load on the mains were 25 per cent of the maximum installed, the load on the mains for cooking would be equivalent to 250 watts per house.

In the same way in a medium-sized house with, say, 20 to 30 lamps and say a 5-kilowatt cooker, the lighting load would be, say, 300 to 400 watts and the average cooking load 625 watts.

It would appear therefore that the cooking load will probably be less than, and it is not likely to exceed, twice the lighting load in any residential area.

In districts where midday dinners are the rule, this would not be serious, and would not involve any addition to the mains, as a drop of four volts during the day would not much matter, but in suburbs of London and districts where late dinners prevail, some addition to the mains would be necessary. In such cases, though it would hardly be necessary to allow for a load three times that required for lighting alone, as in the winter months only a proportion of the cookers would be in use. It would probably be amply sufficient to allow for a cooking load in the winter equal to the lighting load. What expense this would involve depends almost entirely on local conditions and the size of the existing mains.

The author does not think, therefore, that it will be found necessary in the majority of cases to allow more than the rate per kilowatt ascertained as above. The most that would be necessary would be to allow another $2.50 to $5.00 to the figure ascertained for standing costs.

Assuming an extra $2.50 to the $20 per kilowatt it will bring the case of late diners from 1.40 cents to 1.50 cents.

It is probable that in three-wire systems the greatest trouble will arise through drop of pressure in the middle wire owing to the fact that individual cooking loads will be heavy in proportion to lighting loads and liable to come on suddenly. New mains should therefore be laid with ample capacity in this respect.

Probable Consumption.

As to the probable consumption of electricity for cooking, it has been assumed for the purpose of reducing the standing costs to a rate per unit that 400 units would be used in a private house per kilowatt installed; *i. e.*, 2,000 units per annum in a 5-kilowatt outfit, but this is rather a tentative figure, and more information on this point would be useful.

It is probable that the figure would vary very much in different houses, and it is possible that the consumption would vary more in proportion to the number of persons in a house than on the kilowatts installed. By some it is reckoned at about 300 units per annum per head.

It is the experience of gas undertakings that the maximum cooking load occurs on Sundays, and it may be assumed that the bulk of the output between sunrise and sunset on Sundays in the summer is due to cooking, although in the winter a good deal is also due to gas radiators. It must be pointed out, however, that the ratio of consumption between lighting and cooking is very different for gas and electricity.

If electricity were used to the same extent as gas for cooking we should have a peak in the middle of the day as high, if not higher than, the peak in the evening. This, however, is a condition that need not be seriously considered at present, but it indicates that cooking will have a greater effect in leveling the load-output curve in the case of electricity than in the case of gas.

Charges.

As to the charges that should be made for current, it seems that at two cents per unit electric cooking with economical apparatus and careful use is equivalent to gas at about 65 cents per 1,000 cubic feet, and assuming that electrical apparatus could be supplied on the same terms as gas cookers it would not be necessary to drop below this figure where gas is above 65 cents per 1,000.

From the foregoing calculations it will appear that it is quite possible to supply current in some places at as low a rate as one cent per unit, and in many places at 1.5 cents, but these prices would not be justified for a cooking load only as there are several items in the cost, such as the service, the reading of meters and collecting of accounts, which are proportional to the number of consumers rather than to the maximum load and though they are included in the standing costs they are not covered by the amount paid in respect of standing costs by small consumers. Such low rates should, therefore, only be given as an addition to a lighting rate sufficient to cover such expenses. A tariff with a fixed charge per annum or per quarter with a low rate for current meets the conditions best, and in such case one meter suffices for both lighting and cooking units.

With a view to encouraging the use of current for cooking, it will no doubt be suggested that a lower price should be charged in the summer than in the winter. This may be advisable when the load would come on mainly in the evening, but not where the bulk would be at midday as in such cases the load is as useful in the winter as in the summer.

In conclusion, the author thinks that central stations need not hesitate to supply current at rates which will be low enough to make the cost of cooking by electricity as cheap as by gas, and it is desirable that they should be prepared to do this. Although at the present prices of apparatus the development is likely to be slow, the prices can only be reduced by the manufacture of greater quantities and everything possible should be done to stimulate this.

New Hydroelectric Plant Assured.

The tone of recent circulars of H. M. Byllesby & Co. is taken to remove all doubt concerning the construction of a hydroelectric plant at Cumberland Falls, on the Cumberland River, near Williamsburg, Ky. This project has been under consideration for some time, and several surveys have been made. No definite announcement has been made by the company regarding construction plans, but circulars recently sent out have referred to Louisville and other Kentucky cities being served from here, so that it is now believed that there is no longer any doubt about the proposition being carried through.

Figures on Cost of Farm Business.

The Eastern Michigan Edison Company operating in the territory immediately contiguous to Detroit, serves 25 cities and villages. Connecting these localities are some 50 miles of 4,600-volt, three-phase distribution lines. These lines were originally built as the tie lines but in response to many pleas for service from farmers service has been extended to them. The company installs transformers meters and service wires free of charge.

Data on four of these lines supplying farms were given by George D. Slaymaker in a paper presented at the recent Michigan Section Convention. In the data no mention is made of the investment figure. This varies from $600 to $1,200 per mile.

From these figures which represent the experience of the Eastern Michigan Company it is concluded that lines built for rural service can be made to pay only in one of the following ways: (1) Make the customer pay part of the investment; (2) Raise rates to farmers; (3) Build lines to connect two or more centers of population of sufficient density to warrant the investment, and take the farm business as a side issue.

Line.	A	B	C	D
Average number lighting meters per mile	4	3	8	5
Average number power meters per mile	2	0	2	2
Average units per lighting meter per month	16	21	27.8	55.5
Average units per power meter per month	82	.....	54	92.7
Average revenue per lighting meter per month	$1.20	$1.37	$1.73	$3.08
Average revenue per power meter per month	$5.17	.....	$3.98	$4.86

Ten Thousand Flatirons on Trial.

The Commonwealth Edison Company of Chicago has just bought 10,000 flatirons. To place over 30 tons of electric flatirons in thousands of homes is no small problem. The methods used by this great company can be followed with profit by all smaller companies confronted with the difficulty of quickly marketing electric heating devices.

An atractively designed folder, entitled "A Pressing Need," is mailed to the customer. This folder invites the customer to "Try this latest improved electric iron in your home free for thirty days. If it does the work we claim it will, to your entire satisfaction, it is yours at cost price—time payments if preferred. Pay no money to our representative. If you desire to keep the iron, bill for same will be mailed to you."

To the folder is attached a postcard which the prospective user signs and mails to the company. An iron is delivered at once. Not all the people who receive the folder will mail the card. Therefore, in order that no possible customer may be overlooked, a delivery wagon calls at each house the day following the mailing of the circular. Iron in hand, the company's representative tells the matron that, if she desires, the iron will be left and can be paid for at the rate of $1.00 a month; or, if she prefers a thirty-days trial, she then signs the postcard and the iron is left.

Several features of the folder deserve mention. The iron is a well known iron, now being extensively advertised in the popular magazines. To link up this publicity, the illustration of the iron on the folder is the same as that used in the manufacturer's magazine advertisements. The iron is also a guaranteed iron and attention is called to the guarantee tag which is also prominently featured in the manufacturer's advertising. In this way the Commonwealth Edison Company is turning into sales the interest or desire aroused by the manufacturer's magazine advertising.

At the same time the Commonwealth Edison Company is using a series of stereoptican slides in motion-picture theaters throughout the city. These slides either show pictorially, or tell tersely the advantages of electric flatirons.

Truck Load of Irons for Commonwealth Edison Company.

Extension in Louisville.

The Louisville Lighting Company is planning the extension of its lines to Anchorage, Middletown and Jeffersontown, and although they are between 10 and 15 miles from its plant, it has decided to transmit current direct to those communities and not to construct substations.

The estimated cost of the extensions is about $30,000. It has been decided to charge 8 cents per kilowatt-hour for energy consumed in Buechel, St. Matthews and other suburbs not more than three miles from the city limits, but a 10-cent rate will be made effective in the communities located farther away.

Public Service Commissions

NEW YORK.

The Public Service Commission for the First District has served upon the companies furnishing gas in the Borough of Manhattan an order fixing the minimum pressure to be maintained by the companies and prescribing various restrictions upon the common variations in such pressure. The order provides that the pressure at the consumer's end of the company's service pipes should never be less than two inches of water. The opinion of the Commission, states that the companies affected by the order have not attempted hitherto to maintain a minimum pressure in excess of 1.5 inches at the end of the service pipes, and that instances have been found where the pressure was less than this figure. The variations are also said to have been frequent and in many instances so excessive as to be annoying, if not actually dangerous. The order provides that on and after July 1, 1913 the maximum daily pressure variation, independent of momentary and pulsating variations in pressure, shall not exceed three inches on any two consecutive days. After July 1, 1914, the daily pressure variation is specified not to exceed 2.5 inches, and after July 1, 1915 not to exceed two inches on two consecutive days.

The Commission has authorized the Third Avenue Railway Company to acquire 28,650 shares of the capital stock of the New York City Interborough Railway Company. In approving the application, the Commission took the position that a provision should be made for the protection of the minority stockholders. At the final hearing, the company stated that it would be willing to pay not to exceed $7 per share for any of the remaining shares of this stock outstanding. This statement was deemed by the Commission a sufficient safeguard from the viewpoint of the minority stockholders. The acquisition of this controlling interest in the New York City Interborough Railway Company will, no doubt, result in better transit conditions in The Bronx, where the road is located.

By the decision of the New York Court of Appeals in the suit brought by the Admiral Realty Company and in two other actions involving similar issues, the Commission and the City of New York have been put in position to go ahead vigorously with the so-called dual plan for rapid-transit extensions in the five boroughs of Greater New York. The decision of the Court, upholding the constitutionality of the proposed financial plan under which the new lines are to be built by a combination of city and private funds, disposes of the last of the legal obstacles to the consummation of the proposed arrangements, and it is expected that the month of July will witness the execution of complete agreements embodying the city's rapid-transit policy for a number of years to come.

OKLAHOMA.

The Corporation Commission has issued an order, effective at once, covering charges to be made by the Home Enterprise Telephone Company, of Woodward, for messages delivered over the Fort Supply Telephone Company's lines. Complaint was made by the latter company that the switching charges imposed by the Home Company were excessive. After hearing evidence as to the rates charged at other points and by other companies, the Commission has ordered that the rate for three-minute talks between Woodward and Fort Supply shall be 20 cents, with 5 cents extra for each additional minute.

OHIO.

The Northwestern Ohio Railway and Power Company has made application to the Public Service Commission for permission to issue $1,100,000 bonds, $500,000 preferred stock and $800,000 common stock to be used for the purchase of the property of the Toledo, Port Clinton and Lakeside Railway Company.

VERMONT.

The Public Service Commission has granted the Passumpsic Telephone Company, with its principal office at Newport, authority to increase its capital stock in the sum of $41,250, to be sold only at par, and the proceeds to be used in full payment of the purchase price of the plant and property of the Citizens Telephone & Telegraph Exchange, at St. Johnsbury. The Passumpsic Telephone Company is controlled by the New England Telephone & Telegraph Company and the Citizens Telephone & Telegraph is an independent company.

A certificate has been granted to the Burlington Traction Company, to execute its bonds in the sum of not exceeding $500,000, bearing interest at the rate of 6 per cent per annum, to be secured by a mortgage on all the property of the Burlington Traction Company and also on all the property owned by the Vergennes Power Company, located at Vergennes, Vt.

The Woodstock Electric Company has been granted authority to increase its capital stock in the sum of $10,000, for the purpose of paying current indebtedness incurred in extending the electric lines of the corporation and other permanent improvements.

GEORGIA.

The Georgia Railway Commission has authorized the Valdosta Light & Power Company to issue $600,000 worth of bonds to go into improvements on the plant but only $365,000 worth of the amount is to be available at once. The balance will be held up until the money is needed.

Coal Production in Pennsylvania.

The production of anthracite in Pennsylvania in 1911 broke all previous records, exceeding the previous maximum output in 1907 by 4,700,000 long tons. The complete returns to the Geological Survey show a production in 1911 of 80,732,015 long tons, valued at $174,852,843. This was an increase over the 1910 output of 5,298,767 long tons in quantity and $14,577,541 in value.

In this increased activity and augmented production in 1911 the anthracite industry was in marked contrast to the bituminous industry, which showed decreases throughout most of the mining regions. Moreover, in most of the bituminous districts prices were generally lower, whereas the average price of anthracite in 1911 was 5 cents a ton higher than in 1910.

The electric furnaces installed at the Sharon (Pa.) plant of the American Steel Foundries Company are expected to be ready for operation September 1. Each furnace has a five-ton capacity. Power will be furnished by the Mahoning & Shenango Traction & Light Company.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 76.—Rewinding Fan Motor.—I should like instructions for rewinding an old-style Western Electric 16-inch fan to use as a small dynamo for gas-engine sparker to generate 10 volts and whatever amperage I can get. The dimensions of the armature are 2.5 inches diameter, 1.25 inches long, with 14 slots drilled with five-sixteenths drill. The field piece is of steel, the coils were 3 inches in diameter and 2 inches long, with 1.5-inch hole inside. The speed of the dynamo may be whatever suits the machine best. The size of the commutator is 1.25 inches diameter and 1 inch long. —F. A. J., Topeka, Kans.

No. 77.—Storage-Battery Launch.—What capacity of storage battery would be required for running a 30-foot launch that accommodates 20 passengers in ferry service? The boat is to make a quarter-mile trip about every half hour and needs to run at only moderate speed. Charging facilities will be at main dock only. Ten lamps must also be supplied in the evening. What size of propelling motor is needed?—N. S. J., St. Louis, Mo.

No. 79.—Electric Hair Clippers.—Are there available on the market electric hair clippers for barbers' use? Recently I saw an electrically driven horse clipper in use in a large livery stable; it seems to me a similar machine could be made for use in barber shops.—P. J. W., Buffalo, N. Y.

No. 80.—Tumbler Switches.—I understand that "tumbler" switches are largely used in England for places where we would use push-button switches. How does this type of switch differ from our common rotary snap switches?—B. F., Aurora, Ill.

No. 81.—Burglar Alarm.— For a closed-circuit burglar alarm which source of current would be best; an alkaline primary battery, a storage battery or a bell-ringing transformer? —A. N. A., Chattanooga, Tenn.

Answers.

No. 71.—Comparative Reliability of Gasoline and Electric Trucks.—Have any of your readers comparative data showing the time for a period of, say, one year that gasoline and electric trucks of two tons capacity are out of service due to breakdowns or repairs?—W. N. R., New Orleans, La.

A short time ago I read an article in which such data were given, but I do not recall the capacity of the trucks that these referred to. The figures showed conclusively that the electric is the more reliable machine. My own observations have verified this to be the actual condition found in general practice. By giving either type of car a general daily inspection and a more thorough one once a week and by providing the proper maintenance shown to be necessary by these inspections, it is possible to make the outage time of both gasoline and electric trucks practically nil. In actual service, however, the gas car is the more neglected for a number of reasons, among which are: it has more moving parts which should receive attention, but which, on account of their number and complexity, seldom receive daily care and are apt to be entirely neglected until breakdown occurs; the electric, on the contrary, has few vital elements and these, aside from the battery, are relatively more rugged and less liable to get out of order; the battery gets a charge every day it is in active service and in connection therewith it and the controller, motor brushes, bearings and transmission quite frequently get inspection, oiling and adjustment. The consequence is that with the improvement in batteries and their more intelligent use the electric truck is much more likely to receive the attention it needs than the gasoline truck. However, cases are known where electrics have been neglected and again where gasoline cars have received unusually good upkeep, so that not much stress can be laid on comparative data unless the actual conditions prevailing are known. Several manufacturers of both types of machines have collected such data but do not make them public for commercial reasons.—J. S. N., New York, N. Y.

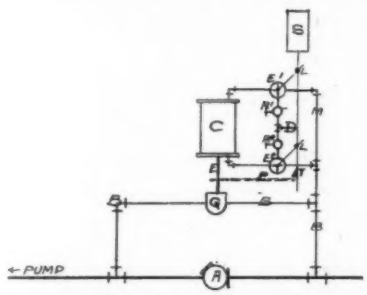
No. 74.—Electric Starter for Automobiles.—In the electric self-starters now being used for gasoline automobiles what provision is made against overdischarging the battery in case the engine refuses to start? What prevents the battery being continually overcharged?—V. B., Milwaukee, Wis.

There is no special provision against overdischarge of the battery. Should the battery become much run down it will be noticed by the low candlepower of the lights and by the inability of the dynamo-motor to turn the engine over, due to lack of torque because of low voltage. However, this could happen only in case of very evident engine or carburetor trouble and at the hands of only a grossly ignorant or careless chauffeur, who would persist in turning the engine over continually for some 20 or 30 minutes without successfully starting it. No instance of this kind has so far been recorded. On the contrary, the electric self-starters and lighters have been found thoroughly reliable as well as convenient, even when subjected to very severe tests. To prevent overcharge there is usually provided an automatic cutout of some kind controlled by a voltage relay or ampere-hour meter that takes the battery off charge as soon as it is well charged. The dynamo voltage is cut down by an automatic regulator and the battery then "floats" across the dynamo leads. —J. S. N., New York, N. Y.

No. 75.—Starting a Distant Pump.—We are planning to install a four-stage centrifugal pump which will be driven by a 75-horsepower, three-phase induction motor supplied with current from a central station a mile away. The pump will deliver water to a standpipe, equally distant, against an average pressure of about 90 pounds. Is there any practical way of starting this pump without sending a man to the pumping station? There will be a check valve in the discharge line. Is there an automatic way of priming such a pump?—J. W. L., Chapel Hill, N. C.

The first part of this question, relating to an automatic starting device for this motor, could best be solved by being referred to the maker of the motor or to some maker of motor-starting devices. In regard to automatically priming the pump when starting up, the following is a rough sketch and description of a device that will very satisfactorily accomplish the purpose. The priming is accomplished by by-passing water around the check valve in the discharge line of the pump. In the figure, *A* is the check valve and *B* the by-pass piping. This piping should be about one-half the diameter of the main pipe, giving one-fourth the flow, the minimum for quick priming. *G* is a gate valve which has had the threaded hole in the yoke or bonnet reamed out to allow the stem to slip up and down to operate the gate. *E* is a piston rod to be connected to the stem of gate valve *G*. At its upper end it is fastened to a piston working in cylinder *C*. *S* is a solenoid with winding adapted to the current used to operate it. If a separate circuit is run from the station to pump house to operate the primer and a starter, a single plain solenoid can be used, in which case it will be necessary to throw the current on this circuit for but about ten seconds. If a separate transmission line is used for the motor so that the motor is stopped and started by switch at the station, some arrangement should be made on the solenoid to give it but momentary current from the motor leads. E^1 and E^2 are three-way cocks with lever handles *L*. The

marks inside these cocks show the position of the ports in the plug with solenoid stem raised. When the solenoid stem drops, the plugs move 90 degrees to the right. In the position shown in the sketch the current has been applied to the solenoid, the tooth *T* on the stem catching on pawl *P*, holding the stem up after the current has been cut off from the solenoid. Water at standpipe pressure is now flowing through pipe *M*, through three-way cock E^2, and under the piston in *C*, raising the rod *E* to which is attached the stem of gate valve *G*. The speed at which this valve is opened is regulated by valve R^1 which can be adjusted to give any speed of valve opening by retarding the flow of water from the top of the cylinder *C* to the waste pipe *D*. When the valve has reached the opening limit, a lug on rod *E* trips pawl *P*, allowing the solenoid stem to drop, thereby reversing the position of the three-way cocks, causing the piston to travel downward and closing the priming valve. To allow ample time for priming and to keep the gate from wedging



No. 75.—Priming of Distant Pump.

in its seat, regulating valve R^2 should be adjusted to let the water out of the bottom of the cylinder very slowly. The area of cylinder *C* should be slightly greater than that of piping *B* to give ample power to operate the valve under all conditions. The piping, except the main by-pass, should all be one-half inch. There are some very reliable electrically operated valves manufactured and on the market, but they are very expensive and much more complicated than this device. It will cost comparatively little to make this priming device. The only machine work necessary is the truing up of the inside of a piece of standard double-strength wrought pipe for the cylinder, truing up a disk of boiler iron for the piston, and truing a piece of water pipe or a rod of iron for the piston rod. The balance of the parts are all of standard fittings, even the cylinder heads.—R. W. E., Chillicothe, O.

The solution of this problem lies in the use of an automatic starter at the pump for starting the motor, the control wires from the magnetic switches running to the distant station. In this way the motor could be started and stopped without the necessity of having a man at the pumping station at the time. If the pump motor receives its power from the same point that it is to be controlled from, and a separate line is used for same, the current can be turned on and off at the central station, effecting the same results. For priming the pump put a by-pass around the check valve and insert in it an electrically operated valve. Connect the coil of the valve-operating apparatus into the motor circuit. Whenever the motor is started this coil will pick up its plunger, opening the valve to which it is connected, and priming the pump. When the motor is shut down the valve will close and prevent water passing into the pump.—F. M. J. M., Middletown, O.

No. 78.—Patentability of an Article Already in Use.—If an article has been invented by a man who does not consider the invention of sufficient value to secure a patent thereon, and if the article has been manufactured and sold in very limited quantities by the original inventor, can another party secure a patent on the article when the original inventor knows, but cannot legally prove, that the second pary got his idea from seeing the article in use?—F. L. T., Duluth, Minn.

This case is a typical case of negligence on the part of the inventor and is almost a common occurrence. The second party can secure a patent for the inventor's device provided that it is patentable of course, and provided further that the sale of the article has not been in force more than two years prior to the application of the second party. The recourse for the inventor in this case is to apply for the patent even at this late date and to place his case in interference with that already allowed and patented. This course will not be of any use unless the inventor can prove priority of conception and reduction to practice over the second party, who already has a strong presumption in his favor. Even if the course is adopted, it must be remembered that it will prove expensive or even useless, particularly if the second party shows fight and has funds for the purpose. A bluff contest might be used to bring him to terms if he is in fact guilty of piracy, but it is likely to lead to expensive complications or failure. If the matter is of any importance a competent patent attorney should be consulted. It is further to be pointed out that the inventor in this case can even be sued as an infringer for continuing to make or sell the articles covered by the second party's patent. While this may seem unfair in some cases, the law is nevertheless just. It provides great opportunities for the inventor but requires that he render an equitable trust by using all possible diligence in conceiving and carrying out the invention and in applying for the patent. While there are a large number of cases which might be cited to support this matter, the parties concerned are referred to Warner vs. Smith, 84 O. G., 311, as a typical example of the principles involved.—P. E., Minneapolis, Minn.

In general the laws relative to the patentability of a scheme or device require that it must be an invention or discovery, it must be new, it must be useful, it must be an art, machine, manufacture or composition of matter, or an improvement of one of these. It must not be known or used by others in this country before its invention or discovery here. Further it must not have been described in any printed publication in this or any foreign country before its invention here more than two years prior to the application for the patent nor can such description have been made or prior patent secured by any person other than the applicant. By the word "described" the law means such a description as will give as clear an explanation of the workings or operation of the invention as the application for the patent itself. The description must also be of an identical device. In addition to these requirements the invention must not have been in public use or on sale in this country for more than two years previous to the date of the application. The use of the invention by others than the applicant for the patent, except those engaged as assistants in the development of the invention, or its use in other than experimental work for a period in excess of two years will render the application invalid. In this feature of the patent laws it makes no difference whether the applicant knew of the existence of the public use or sale of the anticipating device or not, as the law regards that even should the device be new to the applicant yet known to other people it is not new or patentable even though it may have been abandoned. An application for a patent must be made out in accordance with a prescribed standard form. There are three distinct features to this standard form, namely the petition, specifications and oath. This last feature of the application apparently removes the possibility of the device in question being patented as it is known that the device has been in public use and on sale by other than the person desiring the patent. To secure a patent he would have to take an oath which would be in direct variance to his knowledge. Even though a patent were secured in this manner it would be subject to litigation which would in all probability result disastrously to the holder of the patent right.—E. C., Kansas City, Mo.

NATIONAL DISTRICT HEATING ASSOCIATION.

Fourth Annual Convention, Detroit, June 25-27.

The fourth annual Convention of the National District Heating Association was held in Detroit, Mich., June 25, 26, and 27, headquarters being established in the Cadillac Hotel. The first session was called to order by President Arthur D. Spencer, who introduced James H. Lee, of Detroit. Mr. Lee, speaking for the Mayor, welcomed the delegates to the city and spoke in high terms of the local heating and light plant, also of the other industries for which Detroit is famous.

Alexander Dow, of Detroit, supplemented the welcome of Senator Lee by inviting the delegates to inspect the public-service plants in Detroit. He also spoke at some length of the industries not mentioned by the previous speaker. George W. Wright, of Baltimore, replied to the welcome.

Secretary Gaskill then presented a list of 40 applications for membership which were favorably acted upon. The address of the president was next in order.

President's Address.

The district heating business is nearly as old as the electric lighting business. As early as 1890 a number of electric lighting companies were selling exhaust steam for heating purposes. The business was supposed to be enormously profitable, and the number of companies selling exhaust steam increased rapidly. In 1904 there were at least 100 heating plants in operation. At the present time there are about 300 heating plants in the United States. Approximately one-half consider the business directly profitable, while practically all agree that the business is of great advantage in connection with electric supply. The value of a combination electric and heating system is being recognized more fully as the companies extend their field to include the large commercial establishments, formerly considered out of reach of the central station. The divided opinion as to the profitable nature of the heating business points to a condition that is very unsatisfactory and almost incredible. Is the business unprofitable in one-half of the cases? If so, is the trouble due to local conditions, or to faulty construction or operation, or to inadequate rates? Are the records and accounting systems in use always adequate to show the true operating results of the heating departments? It is doubtful if a majority of heating companies have the necessary data to make up a reliable operating balance. Failure to show profit may be due to inadequate rates. The tendency of many managers to consider heating revenue practically all net gain has caused them to establish rate schedules without due consideration of the value of the service to the consumer, or of its cost to the company. The value of the service will generally permit rates based on the cost of supplying live steam, and rates should always be so based, rather than on the assumption that the steam is a by-product, an assumption which has not always proven correct. Faulty construction or improper operation may account for a financial loss. Undoubtedly local conditions have much to do with the success or failure of a heating system; and undoubtedly plants are in operation in many places where local conditions do not warrant the investment. Plants operated principally for the advantage in obtaining electrical business may be operating at a loss due to the carrying of business not directly desirable, such as restaurants, etc., which require summer service. Low rate may be intentionally established, in order to facilitate the taking over of private plants, with combined heating and electrical load. This does not seem warranted, except where the value of the service to the consumer will not permit higher rates and where the net result is an advantage to the entire electric business. Undoubtedly the greatest causes of loss have been lack of information as to the experience of other companies and failure to appreciate the chances for loss and the conditions necessary for success. This association is in a position to collect such information and to publish it for the benefit of companies operating heating plants. This work is the most important function of this association. It would seem desirable for the association to adopt a commercial standard for allowable moisture in steam.

Reports were then presented by the secretary-treasurer and the Membership Committee. Following this the report of the Committee on Meters was presented by A. P. Briggs, chairman. This report describes briefly the meters in whose use central heating companies are particularly interested. These are discussed as condensation steam flow and boiler-feed meters, miscellaneous testing instruments being noted in the appendix.

Alexander Dow, of Detroit, opened the discussion. He said that consistency is more to be desired in a meter than ultimate accuracy. He suggested numerous developments in the design of meters.

J. F. Lewis, of Detroit, stated that meter readings are taken in Detroit every four to eight days and the reading compared with previous years' records and temperature. No test is made unless the customer making complaint is present.

G. W. Wright spoke in defense of the meter, stating that it was not given enough attention. He thought meters should be read every day. The cost is not excessive and is justified by the results. Of 191 complaints received by Mr. Wright in one season less than 34 per cent were due to meters. In reply to a question he added that the customers did not object to having meters read each day as it was provided for in the company's contract.

Mr. Bishop called attention to the necessity for testing and overhauling meters at the end of each season. He also stated that good results have been obtained, in the matter of testing, by requiring the customer to pay for the test and for the uncharged portion of the bill, if the meter is slow and refunding if the meter is fast.

Brief remarks were also made by A. Dow, President Spencer and A. P. Biggs in conclusion.

The Tuesday afternoon session was called to order at 2:00 o'clock with President Spencer in the chair. The first paper was entitled "Common Sources of Trouble in Customers' Installations" by E. Darrow, of Indianapolis.

Common Sources of Trouble in Customer's Installations.

Mr. Darrow describes briefly the system of the Merchants' Heat & Light Company, Indianapolis, Ind. This consists of two electric lighting plants connected by 30-inch and 20-inch steam mains. The plants may operate condensing or non-condensing with high efficiency as the demand may require. The heating system serves an area of about four square miles, to a mixed class of users. The specifications and requirements of the company include the designing of the customer's installation in such manner that with one pound pressure at service valve, a temperature of 70 degrees can be maintained, when the outside temperature is 10 degrees below zero. The company has for years conducted a campaign of education for architects and piping contractors along lines which will insure adequate radiation for zero weather, and to this end has insisted that plans be submitted to the company's engineering department to be checked up, before a contract for heating would be accepted. In order that radiators may be active, the air valves must be sensitive, so that they will respond quickly to the cooling that takes place with an air accumulation.

The company requires every customer's installation to be equipped with at least one thermo-control valve. The valve is usually placed near the point of entry of the service to the building and is controlled by a thermostat at the most suitable location. Unless otherwise ordered, it is set for 70 degrees. On streets where there is air pressure lines, the Powers regulating valve is used. In districts where there is no air, the Sylphon Regitherm control, which is entirely mechanical and self-contained, is used. Another factor is the cooling or economizing coil. This again is a requirement that has to be insisted upon in many cases. 15 per cent to 20 per cent of the total radiation must be in the form of cooling coils. This is partly due to the company's desire to utilize all the heat possible in the steam supplied and partly because the city's ordinances require that the trap discharges shall not exceed 125 degrees Fahrenheit, the company's aim is always to get the last heat unit from the steam. The 30-inch lines are all in tunnels but for the sizes 20 inches and down, they have adopted for the outer wall ordinary

sewer tile, split longitudinally in half. Expansion joints and traps are placed in manholes approximately 200 feet apart. Considerable care and inspection are required to keep expansion joints and traps in perfect condition. For covering of street mains, the insulation must be fireproof, water proof and flexible to a slight degree. They have lately adopted a mineral covering for pipes which they believed more nearly approaches the ideal covering than any heretofore offered. It is a sectional moulded covering, has an insulating quality as good as 85 per cent magnesia, is apparently not mechanically injured by repeated wettings and dryings, and has high heat resisting qualities.

This paper elicited some considerable discussion, Mr. Wetherell raising the question as to the advisability of installing cooling coils. He said that he was trying to get away from the use of cooling coils as much as possible by using the atmospheric system. In Peoria there are two rates—a 26-cent rate with the cooling coil, and a 30-cent flat rate if the cooling coil is not installed. Personally he would rather do all the business they could get on a 30-cent flat rate.

Mr. Negley, of Canton, raised a question regarding the use of Power regulators. He finds that a great many of them do not work, particularly where they are used with galvanized-iron pipe, which is being continually attacked by electrolytic and other action that the service is rather unsatisfactory. Mr. Negley also related an experience his company had had with oil coming into the heating system, clogging up the surface pipes. His company had built a round tank four feet in diameter, six feet long, with 10-inch openings in the top and bottom. Three baffle plates had been inserted, two from the top extending down, and one from the bottom extending up, all three baffle plates overlapping each other. All steam was forced to go around these baffle plates on the same principle as a separator, but he believed that the size of the apparatus he had described was the reason why it had worked so satisfactorily.

Replying to these and other questions, Mr. Darrow said that he thought that cooling coils were of some advantage. So far as bringing dust into the house is concerned it was his opinion that fresh air had to be introduced anyway, and it might just as well be taken through the cooling coil, in which event it would conserve for the central station company the heat units which would otherwise go into the sewer and waste. He said that his company was operating a low-pressure heating system, the maximum pressue being 12 pounds during extremely cold weather, with an average pressure of between six and seven pounds. The pressure was maintained from September 25 to May 25 uniformly. The hot water from condensation does not return to the power house, the layout and contour of Indianapolis being very level and the water is trapped into the gravel subsoil.

Mr. Gifford, contributing to this discussion, said that the use of lead pipe would eliminate practically all the difficulties experienced by the various companies due to leaks and air holes in the system.

The paper entitled "The Quality of Steam Served by a Central-Station Company to its Customers" by A. C. Shepherd, of the Cleveland Electric Illuminating Company, was read.

Quality of Steam.

Mr. Shepherd described the tests made by the Cleveland Electric Illuminating Company, using the barrel calorimeter and the jet continuous condensing calorimeter. Checking these tests and allowing for error, it was his opinion that the steam supplied by this company to its customers for heating purposes was commercially dry.

This paper brought out some discussion principally relating to the percentage of moisture found in the steam. A. T. Biggs, of Detroit, said that in an extreme case the percentage of moisture was 19 per cent. In general the maximum losses were between five per cent in one case varying to about 2.5 per cent as an average. If more than four per cent of moisture was found, making allowances for separator losses, a revision of the customer's accounts was ordered.

President Spencer said that in Detroit the average has been less than five per cent of moisture, but they had been obliged in quite a few cases to install separators to satisfy customers.

In reply to several questions, Mr. Shepherd said that the system is operated on a pressure of three to seven pounds, generally averaging 4.5 to five pounds. The company generally establishes pressure gauges at the extreme ends of the line so that no trouble has been experienced at the dead ends.

The report of the Committee on Station Records was read by Mr. Wetherell.

Station Records.

The committee was unable to secure sufficient data from the member companies to compile a systematic report, and in this exigency presented a study of the system adopted by the Peoria Gas & Electric Company, Peoria, Ill., assuming that this might be of assistance to those companies not already operating under some definite system. This system includes, essentially: A boiler service report, giving number of boilers and the time they were put on the line and started. Also all repairs made on boilers each day. An engine service report, which indicates the number of hours the various engines and pumps are in service, also all repairs. A daily coal handling report, giving number of men handling coal and hours worked; number and sizes of cars unloaded, and amount of coal in bunkers and pit. A daily steam report, showing the hourly readings of a steam flow meter, giving number of pounds of live and exhaust steam used. A Venturi meter gives amount of water used at all times; a recording thermometer indicates temperature of feed water, and there are charts made by recording gauges daily on boiler pressure, vacuum, temperature of feed water, pressure of heating mains just before it leaves the stations. There is also a recording pressure gauge at the extreme end of the line, with an electrical connection giving the engineer accurate indications of conditions at the main at the end of the line. With this guide the engineer operates in accordance with the pressure at the end of the line regardless of the pressure shown at the plant. The report further describes the Peoria company's methods of handling new business, complaints and order routine, and shows illustrations of the forms used with this system.

Mr. Wetherell described the mechanical principles of the recording gauge for the line ends, and stated that in all probability this instrument would be upon the market the first of next year. With respect to a service card, he said that it was not usually difficult to get these signed, but that in some cases a property owner objected to signing the card without scratching off the part where it gives permission to run through their building. In most cases the company was able to get the owner to accede to this demand by agreeing to take out the run any time it interferred with the building if the owner desired to make any changes. As he remembered there were only one or two cases where they had to take the srvice out.

There was considerable discussion with regard to the relation of the amount of heat necessary to keep the system up and wind velocity. Some stations keep a close record of wind velocity, and Mr. Chapman described the method by which his company kept a record of wind velocities. They have five different schedules and change the temperature of the water and also the pressure to conform with the wind because it was found that they could heat the entire system a great deal easier if it were below zero and no wind than they could at 10 above zero with a good deal of wind blowing from the northeast. His company secured excellent results from the use of an anemometer and recording devices.

Secretary Gaskill read the proposed amendments to the constitution. These amendments were read for information so that action might be taken later. The meeting then adjourned until Wednesday.

The steamer *Pleasure* was chartered for Wednesday, the session being held

Wednesday Sessions.

ab ard the boat enroute to Lake St. Clair and return to Belle Isle, where supper was served. A considerable portion of the morning session was devoted to a discussion of proposed constitutional changes having to do with membership classification. Following the discussion a motion was made and passed requesting the American Society of Heating and Ventilating Engineers to appoint a committee to confer with a similar committee of the National District Heating Association on current topics in heating and ventilating.

The paper on "Analysis of Heating Rates" was then presented by A. E. Duram, of Chicago. This paper, discussed the equitable bases of charging for steam heating. Any schedule based on area of radiation, said the speaker, is but a poor system of guessing while the purely meter rates are found hardly adequate to meet the conditions of the large prospective user operating his own plant. Submitting the rate schedules of a number of cities to illustrate the divergence in charges, Mr. Duram showed how actual station costs of production might be plotted in the process of devising an equitable rate based on a readiness-to-serve charge plus a metered quantity charge for all steam consumed beyond this minimum.

Before discussing this paper the report of the Committee on Rates was presented by Mr. Wilder.

This report, prepared by R. D. De Wolf, of Rochester, N. Y., and J. L. Hecht, of Chicago, compiled the replies received from 107 steam-heating companies and 40 hot-water-heating companies, although, as the Committee pointed out, an adequate summary of results is not possible without further statement of conditions under which service is supplied. A wide range is indicated in both rates and methods, although an attempt was made in the report to summarize contract clauses used. Tabulated data of the relative cost per 1000 pounds of steam and the percentage of exhaust steam utilized, together with the cost of coal where given, are also included in the report.

These papers were discussed by L. D. West, S. M. Bushnell, A. D. Spencer, H. A. Austin and A. C. Rogers. Mr. West stated that some mistake was made in tabulating the Cleveland rate as 35 cents is the maximum rate per 1,000 pounds and 25 cents per square foot.

Mr. Bushnell stated that results similar to those reported had been found by the District-Heating Committee of the National Electric Light Association.

Mr. Austin did not approve of the use of "square foot of radiation" as a basis for estimating rate but rather "cubic feet of space." Mr. Donahue thought that the former method was preferable. This was also concurred in by Mr. Rogers, who objected that cubical contents is only one of the four quantities involved. The factors considered by the Toledo company are glass area, exposed wall, cubical contents and exposure.

At this point the report of the Nominating Committee was presented and the following officers declared elected.

President, R. D. De Wolf, Rochester, N. Y.; first vice-president, J. F. Lewis, Detroit, Mich.; second vice-president J. L. Hecht, Chicago Ill.; third vice-president, E. Darrow, Indianapolis, Ind.; secretary-treasurer, D. L. Gaskill, Greenville, Ohio;

Executive Committee: W. A. Wolls, Cleveland, Ohio, H. R. Weatherell, Peoria, Ill., and A. D. Spencer, Detroit, Mich.

The afternoon session was opened with the paper by J. F. Lewis, of Detroit, on "Description of the Power Plant of the Murphy Power Company."

This station, occupies a ground area 148 feet by 125 feet and contains two 500-kilowatts and two 1500-kilowatts turbo-alternators, delivering 4600-volt, 60-cycle energy. There are twelve 400-horsepower boilers, and low-pressure exhaust steam is supplied for heating through 30,000 feet of distributing system, the majority of which is of standard wood-log construction. High-pressure steam is also supplied for cooking purposes, and refrigerated brine is circulated for cooling ice boxes.

During the discussion which followed, A. P. Biggs recounted the experience of the Central Heating Company, Detroit, with seals. Out of 400 cases of trap adjustments, only 25 cases were found where the seal leaked. The company always makes a second inspection after requiring that repairs be made, in this way assuring itself that proper corrective measures have been taken.

L. H. Murphy, Detroit, declared cooking with exhaust steam to be out of the question on account of its low temperature, but Mr. Lewis related instances where, with special equipment having more ample steam passages than is customary, such steam is used successfully for cooking at pressures of only from 6 pounds to 8 pounds per square inch.

This discussion was followed by the paper on "Sectional Steam Heating in Chicago," by S. Morgan Bushnell.

This paper describes the practices of the Illinois Maintenance Company which does not maintain a central plant, but operates existing steam-boiler plants in downtown office buildings. An engineer visits and inspects the individual heating plants daily, exercising the same supervision over labor and supplies as if in a central power house. As the company has little or no investment in its plants, the rates charged are lower than in similar large cities. Isolated plant owners in Chicago have now largely overcome their former prejudice against turning over their plants to be operated by outsiders, finding that the experience of the operating company enables the same service to be supplied at a considerable saving of former wastes. The first contracts made for heating were for short terms only, averaging five years or so in length. Recent contracts, however, cover periods from ten to twenty years, as these longer terms serve to stabilize the busines, enabling smaller customers to be picked up in the vicinity and thus adding to the profitable character of the business.

The first paper of the Thursday morning session was one entitled "Heating in Connection With Steam Turbines," by August H. Kruesi of the General Electric Company.

Heating in Connection With Steam Turbines.

This paper described some new developments in steam turbines providing for the extraction of steam for steam and hot-water heating. These turbines have been designed from 500 to 2,000 kilowatts in capacity. The use of turbines in connection with heating is advocated on the ground that any work obtained from the steam is a gain as compared with the separate use of live steam for heating. Curves and tables were given showing the performance of one of these turbines under various conditions of back pressure and amount of steam extracted. With hot-water systems the heat transfers are made at lower temperature and pressure, so that more work may be abstracted by the turbine with little reduction in the heat value of the steam. The new turbines have governors, valves, etc., proportioned for a sufficient flow of steam to carry full capacity, non-condensing against back pressure up to 10 pounds. As this operation of turbines has sometimes been handicapped by variable electrical load, automatic valve-gear has been developed which successively opens or closes the nozzles, each of which is either wide open or entirely closed at any time. These valves may be actuated by hand or by steam pressure. An equivalent result can be reached with turbines, at present in use by an automatic reducing valve between the turbine and the heating system. The author considers a properly designed steam system with vacuum return as satisfactory as a hot-water system and practicable for district heating. He advocated the separate measurement of the steam output of individual boilers, of feed water, of temperatures and flue-gas constituents. With more exact measurements, comparisons between different methods could be made which are seldom possible now. The heat represented by super-heating from the use of a reducing valve rarely reaches the consumer, and to that extent the use of live steam represents a direct loss. Experience has shown that it is more economical to operate boilers separately at the pressure in a heating system than to supply high-tension steam through a reducing valve.

This paper was discussed by Messrs. Ruth, Woodworth, Parsons, English, Wilder, Rogers, Westover, Dreyfus, West and Bishop. Mr. Parsons did not think it practicable to measure the steam on the low-pressure side with

a flow meter. He thought there should be a better means of measuring it. Mr. Wilder gave a formula for the amount of steam used, which could be represented as a constant quantity plus a quantity proportional to the kilowatt-hours plus a certain percentage of the steam left. He gave the numerical constants for a particular case.

Mr. Westover found that a flow meter could be used on the low-pressure side if the flow was steady. Mr. Dreyfus explained the advantage of pulsation from a reciprocating engine to be due to the effect of sweeping moisture off the surfaces of the pipe, which permitted more rapid radiation. He thought an automatic vibrator for the same purpose could be introduced with turbines. Mr. Bishop did not agree that it was more economical to operate boilers separately for the heating system than to supply high-pressure steam through a reducing valve.

Mr. Kruesi closed the discussion by answering a number of points that had been raised. He emphasized the point that steam consumption is not the whole measure of the desirability of a prime mover. Considering all factors, including fixed charges, an inferior turbine will often be found more desirable than a good reciprocating engine. He said that any kind of a velocity meter is subject to the same errors at low flows as the steam-flow meter. He quoted Canton, O., and Rockford, Ill., as two stations where greater economy had been demonstrated by operating boilers separately at low pressure rather than using a reducing valve.

The next paper, by G. E. Chapman, was entitled "Description of a Large Hot-Water Heating System."

Description of Hot-Water Heating System.

This paper described the plant of the Public Service Company of Northern Illinois in the village of Oak Park. This is operated in connection with an electric plant. Of the 14 Stirling boilers, four are used exclusively for heating water. All are fired by Green automatic stokers. Removal of ashes is accomplished by means of a pneumatic suction system which can handle 350 pounds per minute and deposits them in a large hopper under which a wagon may be driven. A Green economizer is used in connection with the heating boilers. It has 7,200 square feet of heating surface, that of each boiler being 3,000 square feet. Four centrifugal turbine-driven pumps are used for circulating the water, one of which is a DeLaval and the other three Terry pumps. A Duplex balanced pump works automatically to make up loss of water from the system. The underground system is laid out with two pipes according to the Yaryan method. The piping is protected by boxing of hemlock with a double air space. The hemlock is first dipped in crude oil. The boxing is filled with oiled shavings securely tamped in. There are 12 miles of mains varying in size from two to ten inches, but consisting mainly of a four-inch size. Seven hundred and ten houses are connected to the system, with a combined radiating surface of 550,000 square feet. The exhaust from the steam-driven machinery is discharged into four Worthington heaters, which can be run singly, in series or in multiple. The combined heating surface is 12,000 square feet and is sufficient for the entire heating system in mild weather. The heating boilers and economizer are used only when the weather is sufficiently severe. A table is given showing the schedule followed, which has given very good results.

This paper was discussed by Messrs. Witten, Woodworth, Donahue, Wall, Kruesi, Westover, English, Bishop and March. The latter inquired as to the proportion of members present interested in hot-water and steam plants. The chairman called for a vote, which showed 11 representing hot-water plants and 21 representing steam plants.

Mr. Witten pointed out the fallacy of the common requirement of architects for heating, based merely upon the outside temperature, which means nothing unless attention is given to the wind. The most severe heating condition found in New York City in twenty years was upon an occasion when the temperature was 20 degrees above zero with a 30-mile wind.

Mr. Chapman then closed the discussion. He described an anemometer which he had rigged up to show the velocity of the wind, as this was an important element in determining the amount of heat necessary, and his schedule included this as one of the variables. It was calibrated by comparisons with the reports of the Weather Bureau. The schedule for the pressure and the temperature of the outgoing water was fixed by wind velocity and outside temperature. Thus, with zero temperature and no wind, the water would leave the station at 195 degrees, but with a wind from 25 to 50 miles an hour the temperature would be raised to 215 degrees. The same temperature would be used for 25-degree weather with a wind velocity above 25 miles an hour as for zero weather with no wind at all. He stated that the life of insulation was good in that part of the village which is high with the soil composed of clay, but where the soil is sandy with lots of surface water it gets in bad condition, and needs renewal in ten years. 1.25-inch pipe is used for all service connections. He had had trouble in operating a DeLaval pump in parallel with a Worthington pump, the pressure being greater when the latter was used alone. Ellis' table is used to determine the amount of pumping for a given area of radiating surface. A factor of 62 per cent is used to allow for the efficiency of the disk which controls the flow. Five to six pounds of water per hour are used per square foot of radiating surface. The return water goes through the heaters first, then to the boiler or economizer as the case may be. The rates are determined entirely by the cubical conditions of the residence.

The next paper was entitled "An Economical Survey of Combined Central Heating and Electric Plants," by E. D. Dreyfus of the Westinghouse Machine Company.

This paper was discussed by Messrs. Bishop, West, English, Kruesi and Rogers.

Mr. Rogers then presented Secretary Gaskill with a testimonial in appreciation of the services which had been rendered by that official since 1909. Secretary Gaskill responded, expressing his gratification and appreciation of the kindness of the members, and reiterated his devotion to the betterment of the Association.

Final Session.

The session opened with the reading of the paper entitled "Depreciation in Underground Distribution Systems," by Mr. Jennings, followed by a brief discussion. An interesting and valuable contribution to the subject matter was made by representatives of the H. W. Johns-Manville Company, Michigan Pipe Company, American District Steam Company, Richard-Wilson Company, W. H. Schott Company and Central Station Engineering Company. These descriptions of various systems of underground construction form a valuable symposium upon this subject, and further attention will be given to them in a subsequent issue.

Resolutions were adopted thanking the Entertainment Committee for the hospitality enjoyed while in Detroit, to President Spencer, to the Edison Illuminating Company of Detroit, to the Murphy Power Company, and to all the firms and exhibitors who had contributed to the success of the convention.

The convention then adjourned.

To Develop 40,000 Horsepower on Willow River.

On the Willow River, 17 miles from Fort George, B. C., is a water power capable of developing a minimum of 40,000 horsepower. This power can be improved at a comparatively small cost. Plans for its immediate development are at present under consideration, and within a short time it is expected that Fort George will be supplied with power (including electric-railway service if necessary) from this source.

USE OF GRAPHIC RECORDERS IN SECURING BETTER OPERATION OF MOTOR-DRIVEN PLANTS.

By H. W. Young.

Many possible advantages of electrically driven plants are neglected by those who have paid for their installation, as frequently mill owners have introduced electric drive without knowing how to get the most out of the new arrangement, and have taken little trouble to determine whether or not their motor equipment is properly distributed and operated. So long as the motors furnish power without giving trouble the question of whether the most economical sizes are being used for each group of machinery is frequently forgotten. The motor manufacturers usually desire and attempt to give the mill owner an economical layout, but without full information as to the character and duration of the loads the best results cannot be obtained.

The change from mechanical to electric drive may have been made under the supervision of engineers, but the most competent of these may recommend a distribution of motors which should be somewhat changed after the equipment has had a fair try-out under actual manufacturing conditions. The owner should therefore do his part by installing the necessary number of graphic recorders as their use will accurately determine the power required for each class of machinery.

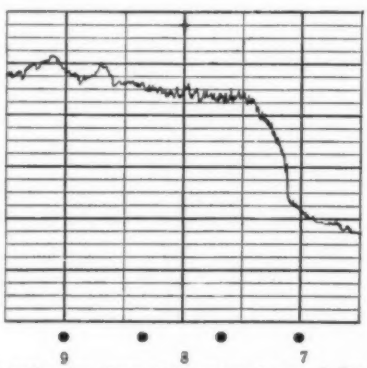
There is valid reason why the mill management should know not only just how much power is required for each group of machinery, but also know the character of load demanded and the hours of machine operation. It is only by knowing these facts that waste can be prevented and the efficiency increased. Aside from recording the amount of power required to perform the work, a graphic meter will also record the exact time a motor started or stopped and this information is valuable from the standpoint of production, as it will enable the management to take such steps as are necessary to correct the trouble, save the time lost and increase production.

In some instances it has been found that the introduction of individual electric drive has resulted in an increase of approximately 20 per cent in production with the same expenditure for labor, but in many instances the increased production has fallen far short of that anticipated.

As hourly operating factory expense is properly chargeable against each machine and continues against it, whether running or idle, it will be readily seen that any method which will give absolute data as to the actual amount of idle and productive time, will be of value.

The portable graphic ammeter and wattmeter is especially valuable for this purpose, as it can be easily connected in circuit with a driving motor and, in addition to recording the power required, it also records the number of moments or hours that the machine was working or idle.

Assuming a factory, the working hours of which are 6:45 a. m. to 5:30 p. m., it will be seen that even though the machine operators report on time, but fail to properly get the work under way, that a loss tremendous in the aggregate will result. By installing the graphic recorder on the circuits supplying every department of the factory, the manager can each day have before him an exact record of the time that the equipment was operating and in a few weeks sufficient data will be available to enable him to tell the amount of time lost by late starting of work or early shutting down of machines.



Wattmeter Record Showing Loss of Productive Time.

As the output of an electrically driven tool is almost directly proportional to the current input to the motor, it will quickly be apparent that if the graphic record shows low energy consumption, that the driven tool was not being worked up to its capacity.

Aside from checking the time of operation, the graphic record also shows whether the motor is properly loaded in order to secure maximum efficiency. Electric drive will not show economy unless it is properly operated and no method is so simple, effective and inexpensive to attain results with as the use of graphic recorders.

As an example of how productive time can be lost and recorded, a section of a wattmeter chart is shown, from an inspection of which it will be seen that at 6:45 a. m., the time of starting, until 7:30 a. m., the motors were not taking their full current capacity and the driven machines were not under full production.

Telephone Papers at the American Institute Meeting.

One session of the annual convention of the American Institute of Electrical Engineers, the report of which appeared in our last issue, was devoted to telegraphy and telephony. Owing to lack of space these papers were not included in the general report.

The following papers were presented and abstracts of them will be found below: "History and Development of Submarine Signaling," by H. J. W. Fay; "The Wiring of Large Buildings for Telephone Service," by Fred L. Rhodes; "The Vibrations of Telephone Diaphragms," by Charles F. Meyer and J. B. Whitehead; "Military Telegraph Lines Using the Polarized Sounder as Receiving Instrument," by George R. Guild.

Submarine Signaling.

Mr. Fay's paper opens with a statement of the dangers at sea, nearly all of which have practically been overcome. Foggy weather is the most treacherous hazard, because lights and astronomical observations become unserviceable and fog horns are unreliable. Submarine signaling is based on the fact that water is an excellent conductor of sound. Mr. Fay reviews the development of the art which had its beginnings in the remote past. It was not until 1898 that the first period of commercial adaptation was reached. Among those who brought it to a successful point were A. J. Mundy, Elisha Gray, J. B. Millet and E. C. Wood. The development of the apparatus is described. A 220-pound bell with a vibration frequency of 1,215 is now used as the sending instrument; it may be operated pneumatically, electrically, or automatically by wave motion through a bell buoy. The receiving apparatus consists of two microphones submerged in iron tanks containing salt water; the tanks are put one on each side a short distance aft of the stern of the ship, as low as possible under the water surface and just inside the skin of the ship. The sound of the bell is transmitted through the skin and tank water to the microphone and then electrically to a telephone receiver in the pilot house; the tank water and a special cushion shut out most of the ship and wave noises. It is possible to determine the direction by submarine signaling very accurately. It can be used for inter-ship communication as well as between ships and signal stations. Over 900 vessels are now equipped, as well as many lighthouses and other signal stations.

The Wiring of Large Buildings for Telephone Service.

On account of the large demand for telephone service in office, commercial and apartment buildings, the provision of adequate space for telephone wires and cables is most important to the owners as well as to telephone companies. From the telephone wiring standpoint, buildings may be divided into two general classes: (1) office and loft buildings; (2) hotels and apartments. The broad distinction between these two classes is that in buildings of the first class the telephones do not remain fixed in num-

ber or location, while in the second class they do. In office buildings the cables from the telephone company's central office are ordinarily brought into the basement, where terminal facilities are installed by the telephone company with equipment so arranged that cross-connections may be made to insure flexibility in the house cable system. The house cables extend from this point up through the building, a shaft or conduits being provided for carrying the house cables vertically. Conduits are used for buildings of twelve stories and under in height; for higher buildings shafts are ordinarily recommended. Branches of the main cables feed each floor. Distributing terminals are placed on these branches at convenient distributing centers. These terminals are located in the halls. Up to this point the system is practically permanent. From the terminals individual pairs of wires are extended as required to the various offices, either in conduits or in open-top moldings on the walls. Hotels or apartment buildings can be wired in advance on a permanent basis as the ultimate requirements can be closely determined by the number of rooms and apartments. The location of the telephones is also generally permanent and relatively in the same location on the various floors. In hotels the wires are all centered at a cross-connecting box, usually located near the hotel switchboard. In apartment houses equipped with a private branch-exchange switchboard, a vertical line of conduits is usually extended up through each tier of apartments through which the house cable is drawn. As in hotels, the wires center at the box arranged for cross-connections near the switchboards. In small apartment houses having no private-branch switchboard, dumbwaiter shafts or small conduits are used for carrying the twisted-pair wires from the basement to each apartment.

The Vibration of Telephone Diaphragms.

In this paper the relation between the amplitude and type of vibrations of the telephone diaphragm in its relation to its exciting current is investigated. The exciting current was measured by an oscillograph and the projection of a beam of light reflected from the surface of the telephone diaphragm was thrown on the same plate with the trace of the exciting current. The paper must be read in order to appreciate the relations which were found. The results show that at some frequencies there is pronounced variation between the vibration and the exciting current; at other frequencies there is little or none. A linear relation is shown to exist between current and amplitude of oscillation of the diaphragm over a range of frequencies extending well beyond that of practice. Resonance curves of several diaphragms are given in the paper and show a quantitative relation with the natural periods of the diaphragms. Diametral vibrations of the diaphragm as distinct from circular vibrations were observed in cases in which they would not have been expected from the symmetry of the instrument. The orientation of the diaphragm over the pole is shown to have a marked effect. A number of similar experiments were made on the transmitter actuated by an approximately harmonic force. This force was applied by a special arrangement of exciting magnet. A linear relation is found to exist in the case of the transmitter also between the variation in the exciting force and the resulting vibration. Resonance curves of the transmitter were also observed showing very pronounced maxima and minima. The observations are supplemented by explanatory discussions.

Military Telegraphy.

This paper shows the desirability of induction telegraphy for field service. It eliminates the need for large numbers of gravity or dry cells that would be required with the ordinary closed or open-circuit lines. The portable induction-telegraph kit used in the army consists of a polarized relay, four-open sounder, key, induction coil and four dry cells installed in a compact box weighing about 12 pounds complete. The paper describes the operation of induction telegraphy, the instruments used and the various circuits that can be employed. The author advocates the use of the polarized sounder exclusively. In the compact portable set which he has developed many valuable features have been incorporated.

Harnessing Tallulah Falls.

Harnessing Tallulah Falls by the Georgia Power Company, Atlanta, Ga., will develop ultimately in the neighborhood of 100,000 horsepower. The falls, located about ninety miles northeast of Atlanta in a mountainous region of Georgia, is one of the most picturesque cataracts in the country and has long been termed the "Niagara of the South." This hydroelectric development, one of the largest in the South, will serve a territory with 225,000 population, distributing energy for manufacturing, lighting and traffic in Gainesville, Atlanta, Newnan, LaGrange, Marietta, Cartersville, Cedartown, Lindale, Rome and intervening towns.

The work under construction embraces principally two dams, the tunnel, the forebay, the power house and the switch house, together with five main substations. The main power dam is one of the cyclopean type of masonry and is being built of rock from a quarry just below the site of the dam. It will measure 384 feet long by 112 feet high. The upper dam, about eight miles upstream and designed for storage purposes, is to be 650 feet long by 90 feet high and will impound nearly four billion cubic feet of water.

About fifty yards from the power dam starts the intake end of the tunnel, which is being lined with concrete averaging 12 inches thick; this will be 12 feet wide at the widest point, 14 feet high to the top of the arch, will extend 6,600 feet and convey the water to the forebay. The forebay is being constructed 30 by 70 by 93 feet deep and also lined with concrete. Six steel penstocks carry the water down the side of the gorge, a drop of 600 feet in 1,000 feet, to the power house. This structure will measure 48 by 192 feet and will be built of brick, steel and concrete. The switchhouse is to be constructed of the same kind of materials and will have foundations 50 by 250 feet.

The flow through each of the six penstocks will drive a single S. Morgan-Smith Company 16,000 horsepower vertical turbine, each turbine being direct connected to a 10,000 kilovolt-ampere, three-phase, 60-cycle waterwheel-type generator. Direct-current excitation for the alternating units will be furnished by an equal number of 100-kilowatt, 250-volt exciter sets. Current will be generated at 6,600 volts and the voltage will be stepped up to 110,000 volts by eighteen 3,333 kilovolt-ampere transformers for transmitting the current over high-tension lines to the distant towns and cities. All this electrical apparatus including switchboards, lightning arresters and also the substation equipments are being supplied by the General Electric Company.

All of the substation transformers are of the out-door type. The transmission lines are in duplicate and are carried on steel towers throughout. The main circuit is of 0000 copper and the branch circuits of 00 copper, all carried on suspension insulators.

It is anticipated that the construction work will be completed and the apparatus installed and in operation some time during the coming fall. Numerous cotton mills and other manufacturing plants in the vicinity of the distribution lines will become consumers of Tallulah Falls power. The Georgia Railway & Electric Company alone will use from 20,000 to 30,000 kilowatts in Atlanta at once. The total transmission system in process of construction extends over a distance of 235 miles.

The design of the entire development as well as all of the engineering details in under the direct supervision of Charles O. Lenz, chief engineer of the Northern Contracting Company, 71 Broadway, New York City.

Low Rates for Logansport.

The Board of Public Works of Logansport, Ind., has decided to furnish electric power for cooking purposes at a rate of two cents per kilowatt-hour after September 1, 1912.

Reductions from the present rate of seven cents will also be made to customers using light and power. For these purposes a primary rate of three cents per kilowatt-hour will be applied to the first thousand kilowatt-hours; for the next thousand kilowatt-hours, two cents, and for all in excess of this, 1.5 cents. An additional discount of 10 per cent is allowed for prompt payment.

The Electric Illumination of New York City on Independence Day.

The electrical Fourth of July was adopted this year by New York City. In place of the historic celebration by noise and fireworks there was substituted an illumination of the buildings and parks of the city.

Statistics of the accidents and fatalities resulting from the celebration of Independence Day in previous years indicate plainly the reason for the movement for a safe and sane Fourth. In 1903 there were 466 killed and 3,983 wounded in the celebration. In 1905 the number of accidents had risen to 5,176; in 1906 to 5,466; and in 1909 there were 215 fatalities. The crusade which was then started against the dangerous features of former celebrations reduced the number greatly.

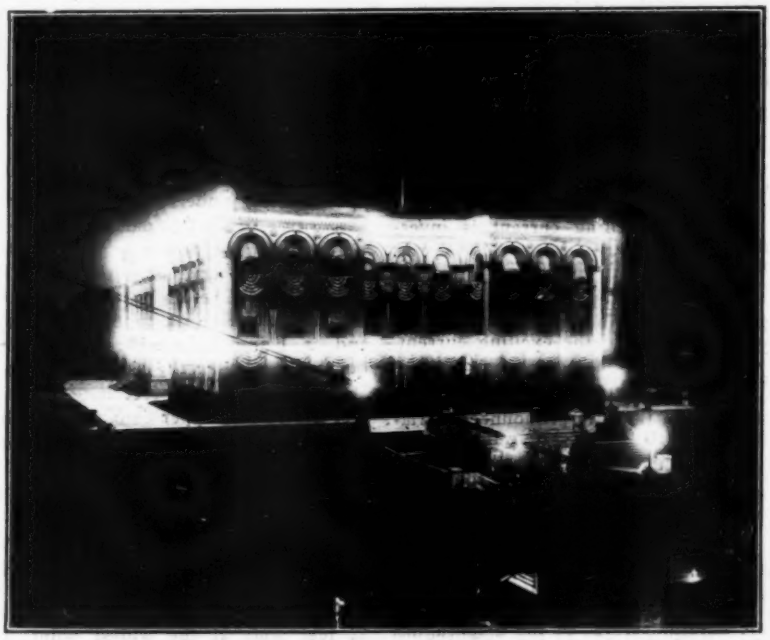
Illumination of Forty-Second Street Office, New York Edison Co.

Electrical illumination supplies the means of celebrating the national anniversary with a glory of beautiful light without incurring the dangers incident to fireworks. The electrical Fourth of July is a thing of beauty as well as of safety. Many colored lights arranged in artistic designs flash out in rare impressiveness their message of patriotism. Residences, statuary, bridges, and other edifices, as well as the trees in the parks, can be strung with lights or outlined in red, white and blue, in such a manner as to bring forth unrestrained admiration. And they are permanent objects on which the eye may gaze, drinking in all of the beauty while on the other hand the fireworks are of but a moment's duration.

The accompanying illustrations show some of the decorations and illumination in the New York celebration this year. Fifteen parks were lighted on the evenings of July 3, 4 and 5, the current being donated by the New York Edison Company. We are indebted to this company for the photographs from which these illustrations were made.

The parks illuminated were: Forty-ninth Street, east of First Avenue; Columbus Park (Mulberry Bend), Bayard and Baxter Streets; Abingdon Square, Eighth Avenue and Hudson Street; Hamilton Fish Park, Pitt, East Houston, Sheriff and Stanton Streets; Chelsea Park, Ninth to Tenth Avenue, Twenty-seventh to Twenty-eighth Streets; De Witt Clinton Park, Fifty-second to Fifty-fourth Streets, at Eleventh Avenue; Riverside Drive, from Eightieth to Eighty-third Street; Carl Schurz Park, Eighty-fourth Street to Eighty-ninth street, East River; Jefferson Park, east of First Avenue, 111th to 114th Street; Mt. Morris Park, Madison Avenue, Mt. Morris Park West, 120th to 124th Streets; McKinley Square, 165th Street and Boston Road; Rutgers Square, Hester, Canal, East

Special Illumination of City Hall and Park.



Special Lighting of Borough Hall.

Broadway and Division Streets; Recreation Park, between 101st and 102nd Streets, Second and Third Avenues; 138th Street and Third Avenue, Henry Street Settlement, Henry Street.

Six thousand electric light bulbs of eight candlepower each were used on lighting City Hall and City Hall Park. The famous old pile glowed like a palace in Arabian Nights set in the midst of an enchanted garden. Festoons of electric lights hidden in Japanese lanterns were strung from tree to tree all through the park. A similar plan of decoration was carried out on Borough Hall in the Bronx. Nearly 100,000 incandescent bulbs were used in all of the illuminations throughout the city. In fact it was the most extensive and beautiful series of illuminations ever arranged for such a celebration.

Comparative Costs of Electric and Horse-Driven Vehicles.

For parcel delivery, nine-hour day, three trips, four parcels delivered per mile and with one minute consumed in each delivery, three-quarters of an hour being allowed for loading and the maximum load being half a ton,

Lighting of Bronx Office of New York Edison Company on July 4.

the horse-drawn vehicle does only two thirds as much work a day as the electric or gasoline truck, at a cost per delivery of 5.9 cents, 5.4 cents and 6.5 cents respectively. The cost per mile by horse is likewise between the two other costs. In the delivery of coal, which is a very different kind of delivery, at the heavy end of the scale, with loads of five tons, the horse wagon (three horses, one resting every third day) does only about half as much work per day as either of the motor trucks. The cost per mile here runs in much the same way as with the light work, being 55 cents for horses, 47 for electrics and 58 for gasoline.

HIGH-VOLTAGE ELECTRIC EQUIPMENT ON THE PLANTATION.

By J. F. Ahern.

One of the installations which illustrates how closely the planter and farmer keeps in touch with, and turns to his profit, the use of modern machinery, is a pumping outfit operating on the 1,700-acre rice plantation of Floyd Williams, Ellis, La., near Crowley.

Transmission Line.

The prime mover is a Fairbanks-Morse 200-horsepower, four-cylinder, four-cycle, quick-start, slow-speed oil engine running on low-grade oils, direct-connected on same cast-iron base to Fairbanks-Morse 170-kilowatt, 2,300-volt, three-phase, 60-cycle alternator, with exciter and switchboard.

The generating set provides current for operating three 75-horsepower Fairbanks-Morse vertical squirrel-cage, 2,200-volt motors direct-connected to vertical centrifugal pumps. One pump is located at the power house, the second three-quarters of a mile away, and the third a half-mile further, or one

Pump House.

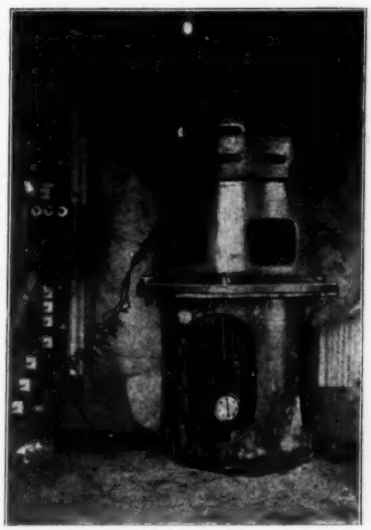
and one-quarter miles from the power house.

The current is transmitted over private pole line on Mr. William's property at 2,300 volts without transformers, except for a small transformer at each pump house which provides 110-volt circuits for lighting the pump houses.

Each motor is connected by coupling to centrifugal pumps throwing 10-inch streams each pump discharging from 3,000 to 4,000 gallons of water per minute. The water stands in the wells from 40 to 60 feet below the surface. Each well supplies about 250 acres. The illustrations herewith show the transmission line, one of the pumps and a pump house. Low-grade oils from Louisiana and Texas refineries operate the engine, and the economy shown has been considerably better than the manufacturer's claims.

Provisions were made so that additional generating units, as well as motors and pumps, can be added in future, if wanted, without materially adding to the cost of attendance. The electrically driven pumps replaced steam-driven outfits, which required at least one attendant at each pump. The present arrangement allows for locating the wells and pumps at the most convenient point for the rice fields flooded, regardless of such conditions as good roads or easy access for coal, transportation, etc.

The electrically driven pump fits into the rice irrigating problem very nicely, as a well that is pumped 65 to 75 twenty-four-hour days per season has considerable sand and sediment drawn from it, and in a few years the pump and column sink and get out of line. A belted vertical pump is hard to keep in line under these conditions. The belt will not stay on when out of line, while the electrically driven vertical pump with motor mounted on the frame overcomes this difficulty.



Motor-Driven Pump.

When a well ceases delivering water, a new one can be sunk nearby, and the pump and motor easily moved without having to move an engine, boiler and smoke-stack. Furthermore, the operation of the pumps can be manipulated to suit the power supply.

Electrochemical Papers at the Convention of the American Institute.

During the convention of the American Institute of Electrical Engineers one session was devoted to papers on electrochemistry. These papers were not included in the general report of the convention in last week's issue.

The papers were as follows: "Electrolytic Corrosion of Iron by Direct Current in Street Soil," by A. F. Ganz; "Thirty Years' Progress in the Electric Furnace," by F. A. J. FitzGerald; "Simplification of Electrothermal Calculations; the Watt and Thermal Ohm," by Carl Hering; "Vacua," by W. R. Whitney; "Metallic Tungsten and Some of its Applications," by W. D. Coolidge; "The Convection and Conduction of Heat and Gases," by Irving Langmuir.

Electrolytic Corrosion of Iron by Direct Current in Street Soil.

The paper describes the results of a number of tests conducted to determine the relative rates of corrosion of commercial steel, commercial wrought iron, ingot iron, and cast iron, when subjected in damp soil to electric currents at such current densities as ordinarily occur in practice where stray currents leave underground structures. The soils were chosen from city street excavations, one a sandy soil and the second a mixture of clay and loam. The weight of iron destroyed by corrosion in each case was also compared with that calculated from Faraday's law. Commercial pipes were used in the tests. Tests were made both with the pipes as received and also with the surfaces of the pipes turned in a lathe to remove all surface scale and irregularities. The attempt was made in all tests to approach practical conditions as nearly as possible. The results show that the corrosion of iron by electrolysis in the two typical kinds of street soils is independent of the value of the applied voltage, except in so far as this determines the amount of current produced, and that less than one volt can produce corrosion by electrolysis. With current densities ranging from 1.7 milliamperes per square foot to 54 milliamperes per square foot, the loss of weight of iron by electrolysis was found at least equal to that calculated by Faraday's law, and was in a number of cases greater than the theoretical loss. In all cases electrolysis was found to cause localized corrosion and decided pitting. Surface scale appeared to accelerate corrosion from electrolysis with all irons except cast iron, and this was specially pronounced in the case of the steel pipes tested. When the surface scale was removed there was found to be practically no difference in the amount of corrosion produced by a given current leaving iron for damp soil among the four kinds of iron tested.

The Electric Furnace.

This paper reviews the various steps in the development of the electric furnace from the time Sir William Siemens first melted steel by this method in 1878. The importance of carbon electrodes in the furnace and the recent improvements in their manufacture and use were considered. The use of silicon carbide for fire bricks is stated to give the best results yet obtained. The development of the induction furnace is then followed and descriptions of a number of furnaces of practical interest are given.

Simplification of Electrothermal Calculations.

In some recent papers the author pointed out directions in which many of the numerous engineering calculations could be greatly simplified by selecting the most suitable units. This simplicity can be enjoyed by the practical engineer if he will make his units decimal multiples of the C. G. S. units; it is this reform which the author urges. The present paper shows the application of this simplified system to the calculations of the electrochemist and the electrothermal engineer, to which this system is particularly well adapted, owing to the fact that the energy keeps changing its form, as in electric furnaces, and it is useless labor to change the units as the form of energy changes. In such a system there is only one unit for each physical quantity, and never more than one. In this system, all power, in whatever form it may be, is represented in watts and all forms of energy in watt-hours, including thermal energy. A flow, transmission, rate of production or consumption of heat, is then expressed in watts. When new units are created, they should be based on this simplified system. A unit of thermal resistance has become important, and a new unit based on these principles is called a thermal ohm; it is equal to the centigrade degree per watt. By the use of this unit, calculations concerning the flow of heat through bodies, as in furnace work, or electric heating devices, become exceedingly simple. The paper includes a table of conversion factors for reducing data concerning thermal resistances and conductances, to and from this simplified system. If W represents the flow of heat energy in watts, T the drop of temperature in centigrade degrees, and R the thermal resistance, then $W=T/R$, provided that R is in thermal ohms.

Vacua.

Dr. Whitney's paper is a discussion of some phenomena relating to the vacua of incandescent lamps. It has long been known that the life of such lamps depends on the degree of vacuum. An improvement on the method of supplementing the vacuum attainable by exhausting pumps is the method of Malignani, which consists in distilling into the bulb a small amount of sulphur or phosphorus and simultaneously passing a high current through the filament, the lamp being closed from the pump. This seems to have the effect of condensing any gases present and results in a very decided improvement in the vacuum. Considerable difficulty is experienced in measuring such low vacua as are then attainable and effort has been directed to developing a vacuum gauge which permits measuring values corresponding to less than 0.002 millimeter of mercury. The Crookes radiometer was suggested and seems to give very excellent qualitative results. With this instrument extended observations on the vacuum conditions were made. It was found that as soon as an incandescent lamp is lighted the vacuum improves. If allowed to stand unlighted at ordinary temperatures the vacuum gradually becomes poorer. This is accounted for on the theory that any gas present in the bulb is thrown upon and deposited on the walls during the period of lighting. The author refers to this as the "clean-up." When the lamp is cool the deposit from the walls seems again to be driven off. The entire subject is of great importance as it is throwing light on the blackening of lamp bulbs, and further investigations are being made.

Convertion and Conduction of Heat in Gases.

This paper is largely a discussion of the results obtained by A. E. Kennelly, C. A. Wright and J. S. von Bylevelt in the experiments described at the 1909 convention. These largely confirm the author's theory of convection, according to which convection consists essentially in conduction through a film of definite thickness. The thickness of the film is related in a simple way to the diameter of the wire.

Metallic Tungsten.

This paper reviews the properties of metallic tungsten in the ductile form, which have already been given in previous papers (see ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for May 14, 1910, and September 30, 1911). The application of ductile tungsten to other uses than incandescent lamps is considered, and its usefulness for electrical contacts, targets in X-ray tubes, resistors in electric furnace, projectiles, and chemical wares pointed out. These are all made possible by its hardness, high melting point, low vapor pressure, high heat conductivity, high specific gravity and high tensile strength.

Wireless Between Coal Mines.

The Somerset Smokeless Coal Company, which has extensive operations in Somerset County and other western Pennsylvania counties, has installed a wireless system of communication between its plants. The system has a range of 600 miles and is said to be superior to the telephone for quick service. Two wireless operators are in charge of the station at Somerset.

Milwaukee to Have Electrical Show.

The largest electrical show in the history of Milwaukee is planned for the first week in February, 1913. Each of the various organizations in the city, the Merchants and Manufacturers' association, the Citizens' Business league, and others, will be sponsors to the exhibition. Definite dates for the show will be set at a meeting of the Electric League on July 15.

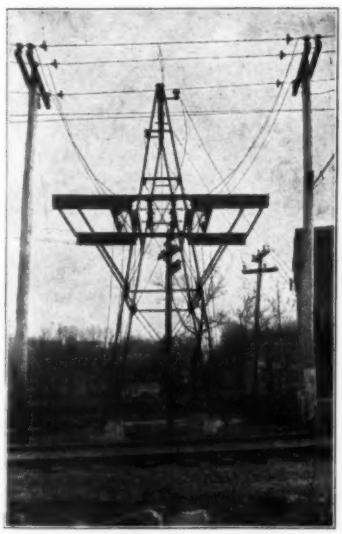
Texas Coal.

The amount of coal mined in Texas in 1911 was the greatest in the history of the industry in that state. The production was 1,974,593 short tons, valued at $3,273,388, an increase over 1910 of 82,417 tons and $112,323. Texas produces both bituminous and lignite coals.

New Electrical and Mechanical Appliances

A New High-Tension Weatherproof Switch.

In deciding upon the system of switching and controlling high-tension transmission systems, the choice of disconnecting switches is governed by several conditions. If it is desired to simply provide means for disconnecting or isolating lines, the regular type of pole mounting, weatherproof, simple disconnecting switch should be used, but when it is necessary to provide means for quickly and safely throwing a station over from one source of supply to another, a different type must be employed.



High-Tension Outdoor Switch.

For use on 33,000-volt, three-phase circuits, the type of switch shown in the accompanying illustration has been developed and is being supplied by the Delta-Star Electric Company, of Chicago, Ill. The switch proper is supported on horizontal iron framework, which is in turn fastened to a specially designed tower located between two of the regular transmission poles.

The switch is of the plunger type, having a set of three movable double-ended contacts so located as to engage three fixed bell-shaped contacts at either end of the framework to which the incoming lines are connected. The movable contacts are attached to line wires running to the station to be connected, and by means of a rack or pinion actuated with charge, the movable contacts can be thrown to either incoming line, all three phases being operated simultaneously.

The switching element is mounted on standard petticoat insulators, easily replaced in case of accidental breakage, thus insuring quick repairs if such become necessary. A number of these switches have been placed in service during the past two years and are successfully meeting the conditions imposed.

Sewing-Machine Motors for Drop-Head and Cabinet Machines.

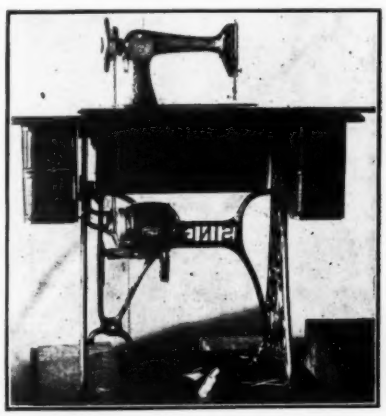
A new type of treadle-control motor is being placed on the market through the agencies of the Singer Sewing Machine Company. This motor is intended for use on all Singer or Wheeler & Wilson sewing machines. Simplicity combined with a minimum of parts formed the rule for the construction of the outfit.

The endeavor of the manufacturers of the new motor has been to eliminate many features which have in the past cast a damper upon the enthusiasm of the housewife for electrically driven machines. As the motor is set in the band-wheel space under the table, no drilling or marring of the table surface is necessary. Neither is there any object supplemental to the electric drive on the table surface to destroy the contour of its lines. The motor placed in the center of gravity does not vibrate the machine table or cabinet; it is entirely removed from accidental contact with the operator's clothing or the material stitched.

The motor frame is cylindrical, grease cups being placed on the under side of the bearings. Wicks regulated by a spring, in place of pins, actuate the flow of the lubricator and insure a positive steady feed. The field cores are entirely composed of steel laminations increasing the power and efficiency of the motor which has a rating of one-twenty-fifth horsepower.

The speed-regulating device is entirely concealed within the end cover, the movable contact being connected by a strong light chain to the treadle. A brass plate, japanned and screwed fast to the yoke, with a series of four step buttons and a neutral point give speed regulation, the maximum machine speed being about 1,000 stitches per minute. Contact is made by a plate having at each end a carbon contact connected by cable, the movements of these contacts across the buttons being controlled by pressure of the machine treadle. A clock spring opens the circuit and regulates the movements of the carbon contacts as pressure on the treadle is varied or entirely removed.

The pulley is saucer shaped and made of pressed steel with a steel hub. It is set on the armature shaft with set screws. An idler wheel is made part of the motor bracket and controlled by a spring. This idler acts as guide and belt-tightener, obviating the necessity of boring an extra hole for the belt through the machine table. The belt from the motor pulley, held in place by a belt guard, runs over the idler. When the machine head is dropped the belt is always in position about the pulley ready for instant use. A leather brake, released by the treadle controlling mechanism when the circuit is broken, bears upon the saucer rim of the pulley causing an instantaneous stop.



Diehl Motor for Singer Sewing Machine.

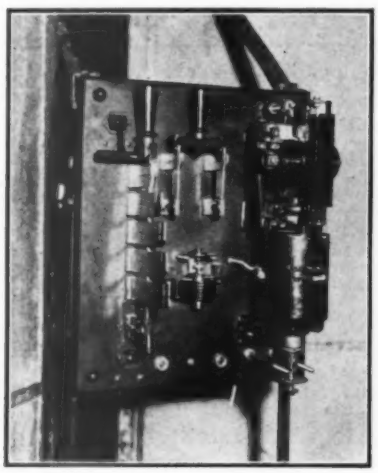
With the idea in mind that an electrical expert is not always immediately available to the purchaser the entire outfit, with the exception of the dress guard, is self-contained and installation work simplified to a remarkable extent. To install the outfit all that is necessary

is to first remove the large band wheel from the stand and set the motor in its place. The steel point on the side of the motor bracket farthest from the pulley is inserted in the band-wheel bearing. With one hand the outfit is held in this position momentarily until a position screw is tightened on the pulley end of the bracket. The turning of this screw fixes the position of the outfit securely in place between the two iron standards of the band-wheel support. A small clamp which bears against the frame at another point gives the apparatus the necessary rigidity.

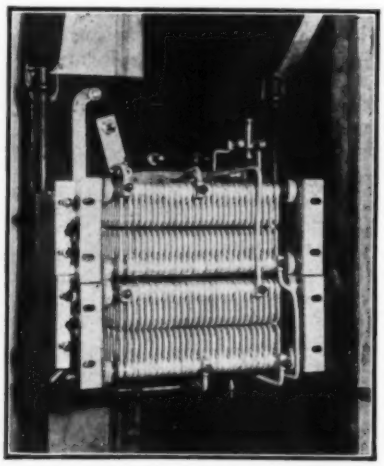
The net weight of the motor, bracket, idler and dress guard is 21 pounds, the shipping weight 45 pounds. This apparatus is manufactured by the Diehl Manufacturing Company, of Elizabethport, N. J., for the Singer Sewing Machine Company exclusively and is for sale only through the latter's agencies.

A Simplified Direct-Current Motor Starter.

The accompaning illustrations show a direct-current motor starter fully



Front View of Motor-Starting Panel.



Rear View of Panel.

equipped with all necessary protective devices and yet remarkably simple in construction and operation. So thoroughly has every source of possible injury been provided against that it is claimed that the most inexperienced operator can operate this starter with safety to the apparatus.

The magnet switch serves to open and close the circuit and its blow-out coils prevent injurious arcing. In conjunction with interlocks and the overload relay this switch also affords low-voltage and overload protection. The two-pole line switch serves to disconnect the motor and starter from the line completely. The multipoint starting switch serves to cut out the starting resistance in several steps. This switch has an interlock contact at each end, one of which must be closed before the magnet switch can operate.

With the starting switch wide open, the operator closes the line switch and then closes the starting switch step by step while he holds its upper interlock closed. Owing to the action of the two interlocks mentioned he cannot start until all the resistance is in circuit nor can he leave the motor operating with part of the resistance still in circuit. When closed the starting switch holds the upper interlock closed.

An overload either while starting or while running operates the relay, causing the magnet switch to open the circuit. Failure of voltage also opens the magnet switch. In either case the starting switch must be completely opened, placing all the starting resistances in circuit before the motor can again be started.

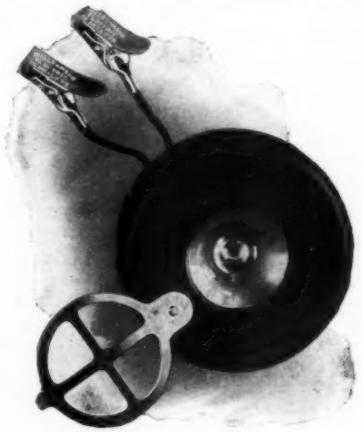
To stop the motor, it is only necessary to pull out the starting switch enough to release the upper interlock. The circuit would then be opened by the dropping of the magnet switch.

All the switches, relays and interlocks are compactly mounted on a slate panel which is provided with supports suitable for floor mounting. In most cases the starting resistor is mounted on the rear of the panel, but when large and heavy is separately mounted.

This device affords a neat, safe, efficient and inexpensive method of starting and protecting constant-speed direct-current motors. It is finished by the Westinghouse Electric & Manufacturing Company and is known as the type S starter, standard. Capacities are suitable for 115-volt motors of from 10 to 60 horsepower, 230-volt motors of from 12.5 to 125 horsepower and 350-volt motors of 30 to 250 horsepower.

The Flexilyte—a Portable Extension Light.

A very compact and convenient extension light has been put on the market by the L. A. Williamson Company, 261 Broadway, New York City. It is known by the trade name Flexilyte. Although designed primarily for use on automobiles and motor boats, the device has been found useful on camping and hunting trips in connection with a light and compact dry battery consisting of four cells assembled in a neat case.



Lamp Side of Flexilyte.

The Flexilyte outfit as designed for automobile use is shown in the accompanying illustrations. It consists of a casing somewhat like that for a measuring tape. A long extension cord can be pulled out of its circumference to any desired length at which the reel can be locked with a thumb catch. The cord can easily be rewound when through using. At the free end of the cord are two spring-clip terminals that can readily be snapped across the dry battery or storage battery on the automobile. For this reason a six-volt two-candlepower Mazda lamp is used. It fits into one side of the case and is backed by a reflector. When not in use the lamp is protected by a guard; this can be turned out to serve as a

Reel-Winding Side of Flexilyte.

handle or means for hanging up the outfit when it is in use.

It is obvious that the outfit permits a thorough and safe examination of any part of the car or boat without danger of igniting any gasoline or having the light blown out by the wind. Other advantages are also self-evident.

Another type of Flexilyte is made for use as an extension on standard 110-volt lighting circuits. It has a larger lamp mounted outside of one side of the case.

Color-Changing Reflectors for Bill-Board Illumination.

Only within recent years has the outdoor advertiser begun to realize that night advertising is more remunerative than that by day. Painted or poster bulletins or wall or wire signs, that only show in the daylight, have been found to bring handsome returns in the shape of publicity. Nevertheless, it has been tested, tried and conclusively proven that these same boards or signs, if illuminated, will increase the publicity and advertising returns as much as 800 to 1,000 per cent. The reason is a very logical one: the average pedestrian, automobilist and other passer-by has an occupied mind during the day and is unlikely to read signs, not being able to spend the necessary time; this same individual, however, after the business day is over, his mind being free, is in a receptive mood and therefore ready to absorb advertisements; furthermore, his attention is arrested by the mass of light and he reads the "ad," one might say, whether he wants to or not. The result is publicity of the very best kind, as it is publicity which sticks.

To secure an effective and economical system of reflection has been the occasion of much experimental work and thought; many forms of reflectors have been tried and found deficient and discarded. However, the Reynolds Electric Flasher Manufacturing Company, of Chicago and New York, has been successful in designing a highly effective, economical and bright reflector and one which is rapidly being adopted by the leading bulletin and billboard interests. It is lined with white porcelain and evenly diffuses the light over every part of the board. By means of a flasher, which is furnished with a weatherproof cabinet, attachable to the back of any sign, it is possible to secure an innovation in billboard lighting, color-changing effects; a billboard changing from white to pink to red to white, etc., renders an attraction which was unthought of a few years back.

Reynolds Color-Changing Reflector and Flasher Outfit.

Nelite Conference.

The Nelite Works of General Electric Company has been holding its first annual convention at the Clifton Hotel, Niagara Falls, Can., during this week. J. Robert Crouse, L. H. Brittin and V. R. Lansingh addressed the conference.

New Eight-Motor Locomotives for New Haven System.

Work is now well under way on a consignment of 39 heavy-service electric locomotives that are being built by the Baldwin-Westinghouse combination for the New York, New Haven & Hartford Railroad Company for use on its lines between New York and New Haven. This is one of the largest consignments of electric locomotives that has ever been under construction and is of further interest in that 36 of the engines are arranged for single-phase service only. There are no decidedly new features involved, as all of the methods used have been heretofore employed; but never before have they been utilized in the special combination devised for these 39 engines. In their construction have been combined what have been shown in every-day road service to be the best features of the heavy locomotives built in the past. An eight-motor driving arrangement similar to that first used in the type-069 New Haven locomotive and an articulated running gear similar to that used for the type-072 locomotives have been adopted. Each engine is driven by four twin-motor units with one such unit mounted over each driving axle. This arrangement has shown itself to be a very desirable one for many reasons.

The articulated running gear has shown itself to be very easy running as far as shock to the equipment in the locomotive cab is concerned, which is one of the reasons why it has been used. The cab rides on top of the semi-eliptic and helical springs in series.

In general design and arrangement all of the locomotives are the same, but three are for both alternating and direct-current operation in fast freight and heavy passenger service and are designed to handle a trailing load of 800 tons at a maximum speed of 45 miles per hour. When operating on single-phase current they take energy at 11,000 volts and 25 cycles, and on direct current at 650 volts. The other 36 of the locomotives are equipped for 11,000-volt, 25-cycle operation only and are primarily for fast freight service but will also sometimes haul passenger trains. They are designed to handle a trailing load of 1,500 tons at a maximum speed of 35 miles per hour. These locomotives are designed to exert a maximum tractive force of 40,000 pounds.

The four pairs of driving wheels and two pairs of small leading wheels are in two groups, each group having outside frames of the bar type. These cast-steel frames are four inches wide and are similar to those used in steam-locomotive practice. The pulling and buffing strains are transmitted entirely through the truck frames which are

braced transversely at the end of the trucks and between the driving axles. A two-wheeled truck of the Rushton type with outside journals is arranged under each end of the locomotive and carries the small guide wheels. The Rushton truck is of the radial type.

A radial-type drawbar, arranged to receive a housing for a Westinghouse friction draft gear, is mounted on each end of the engine. Thrust springs are provided to limit the lateral movement of the drawbar. Each group of two pairs of driving wheels and a pair of truck wheels is equalized on each side of the locomotive. The cab covers the whole locomotive and is built of steel plate on a Z-bar frame. The weight of the cab is transferred to the truck frames through coiled springs, and the spring-pocket plungers slide on the frame cross ties when the engine is traversing curves. Thus the cab floats on the trucks, being held in proper alinement with them by the center pins.

The principal dimensions of all 36 of the locomotives are as follows: length between coupler faces, 50 feet; width over all, 10 feet 3 inches; height to top of clear story, 13 feet 10 inches; rigid wheel-base, 8 feet; total wheel-base, 40 feet 6 inches; diameter driving wheels, 63 inches; diameter truck wheels, 36 inches; weight on driving wheels, 182,000 pounds; total locomotive weight, 240,000 pounds.

Eight No. 409 C, single-phase, commutator-type, series motors, having a capacity of 170-horsepower on a one-hour rating, drive each locomotive. The motors are grouped together in pairs. The two motors of each pair, a right-hand and a left-hand motor, are bolted together so as to form a unit. One pair of motors is mounted rigidly on the truck frame over each of the four driving axles. Each pair of motors is provided with two axle bearings which carry a quill that is concentric with and surrounds the axle. A single gear is secured on one end of the quill and into this gear mesh the two pinions keyed on the motor-armature shafts.

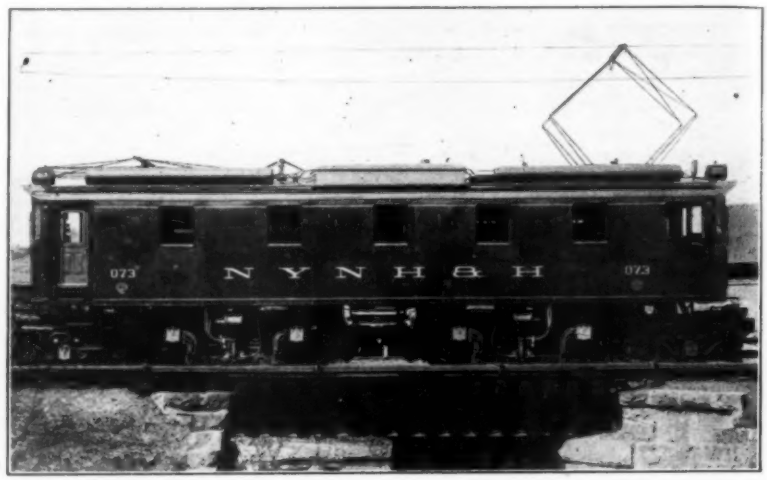
Mechanical connection between the quills and the driving wheels is effected through helical springs which are mounted between the driver spokes and the projecting arms on each end of the quill. A radial clearance of 1.5 inches is provided between the inside of the quill and drive-wheel axle so that the drivers are free to follow irregularities in tracks.

This method of mounting relieves the axles of the dead weight of the motors and insures that the operation of the locomotive will be easier on the tracks. The tops of the motors extend into the cab about six inches above the floor line. A low deck is built over each pair of motors and doors are provided in the decks in such positions that free access to the commutators and armature bearings is afforded. Flexible leads extend through insulating bushings in the floor and connect the motors with the control apparatus.

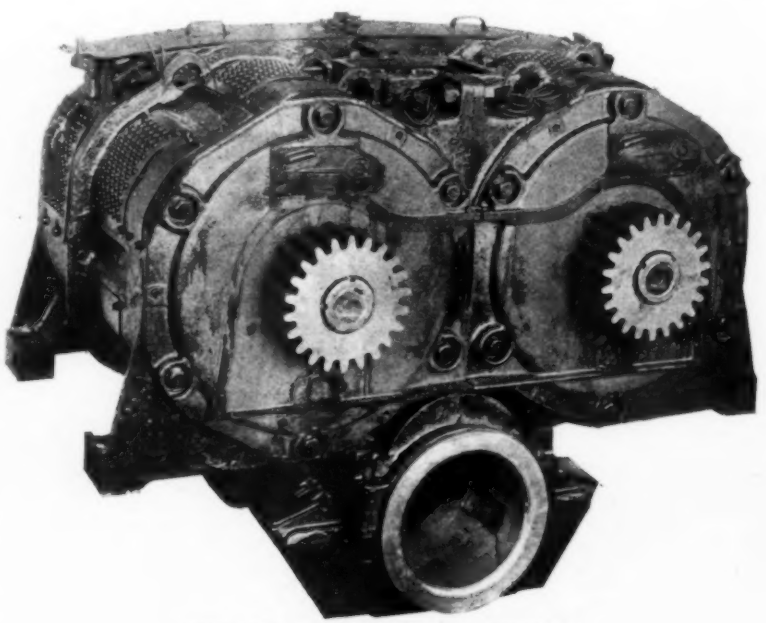
Three of the locomotives are provided with control equipment that can be used in either alternating or direct-current service. Therefore the pneumatically operated control switches work in combination with a transformer and preventive coils when the locomotive is receiving single-phase energy and in combination with grid resistors when it is receiving direct current.

Each pair of motors is connected permanently in series. In alternating-current operation the four pairs are connected in multiple and on the direct-current line they may be connected two pairs in series or all four pairs in parallel. When operating on alternating current at 11,000 volts the current passes through an oil circuit-breaker to the primary of a main transformer and thence to ground. A number of taps are provided on the secondary winding of this transformer and are connected, through preventive coils, by means of the pneumatically operated switches to the motor circuits. There are twelve voltage steps on the transformer winding, nine of which are for running points.

The pneumatic switches used for operation on alternating current are assembled in one group located close to the transformer. Reversal of the direction of rotation of the motors is effect-



New Eight-Motor Locomotive for New Haven System.



Pinion End of Twin-Motor Group Assembled.

ed with two pneumatically operated drum-type reversers. Each of these is so connected as to handle two pairs of motors. When the locomotives are on direct current the control of the motors is accomplished with two other groups of pneumatically operated switches which connect the pairs of motors in series and in parallel, in combination with the resistors. The switches and resistors used for this purpose are supported at the center of one end of the locomotive. The switches are arranged in one straight line with the resistors directly above them so that the connecting leads between switches and resistors are of minimum length.

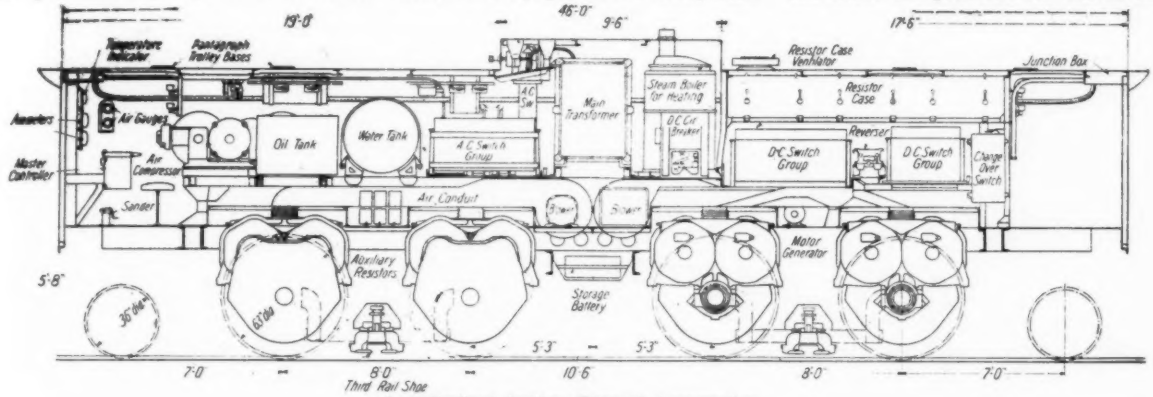
Two master controllers, one located in each end of the cab, are provided. With these the operation of all the pneumatically operated switches and reversers can be regulated when the locomotive is running either on alternating current or direct current.

Two Sirocco-type blowers for handling cooling air, each driven by a small alternating or direct-current motor, are located in the center of the cab directly under the main transformer. These blowers draw their air from outside of the locomotive and discharge it through the main transformer, motors and resistors. The equipment is thereby maintained at a moderate temperature even when operating under severe overloads.

A double air-brake equipment is provided on each locomotive. Two compressors, each having a capacity of 50 cubic feet of free air per minute, are mounted within the cab to supply air for the brake and control apparatus. Brake shoes are applied to all of the driving wheels and separate pairs of cylinders are provided for each group of wheels. The brakes can be applied to one group with a handwheel located in the cab so that a locomotive can be held while standing in the yards.

An oil-burning steam-heater plant capable of supplying 800 pounds of steam per hour is installed in the three alternating and direct-current locomotives for the heating of passenger trains.

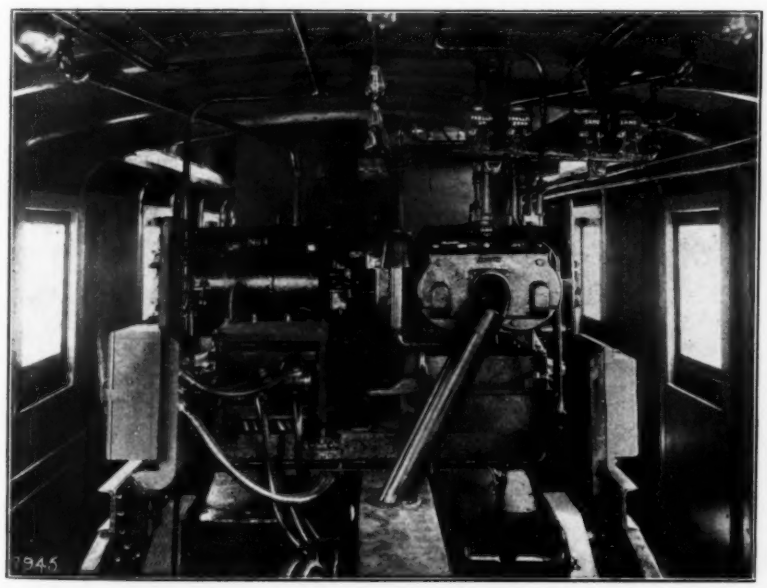
For collecting the current there are two pneumatically operated pantograph trolleys for use with an overhead wire, and four pneumatically operated third-rail shoes are provided for use in the direct-current zone. There is also a small overhead direct-current shoe-type collector for use at cross-overs.



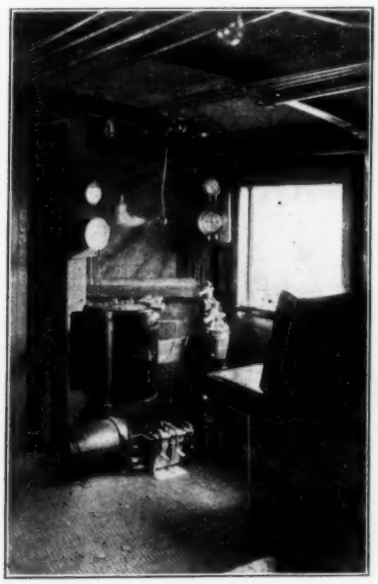
Longitudinal Section Through Locomotive.

Correction.

In the pumping data published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for June 1, 1912 there appeared on page 1040, the statement that a 20-horsepower motor was operating a Keystone Driller Company's plunger pump, with pump head, 34 feet; rods 2.5 inches; working barrel 7.75 inches; capacity 250 gallons per minute. The pump head should have been given as 260 feet instead of 34, which is the catalog number. The capacity of this pump is 250 gallons against a head of 100 feet.



Interior View, Showing Reverser, Air Duct, Motor-Generator, Air Compressors, Blower Motor, Transformer, Etc.



Operating Equipment in Each Cab.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, Inc., have labels attached to each cabinet.

The following manufacturers are equipped to supply these cabinets so labeled:

Electrical Manufacturing Company, 1953 Lawrence Street, Denver, Colo.
Approved May 1, 1912.

Electric Railway & Manufacturers' Supply Company, 84-88 Second Street, San Francisco, Cal.
Approved May 1, 1912.

Warder, Clark & Chaplin Electric Company, 406 Main Street, East, Rochester, N. Y.
Approved May 4, 1912.

CABLE CONNECTOR.—General Electric Company, Schnectady, New York.

"Punched-Copper Cable Connectors" consisting of two solder terminals having a jaw and blade connection secured by a bolt and washers.

While these connectors are not considered satisfactory substitutes for soldered joints in general wiring, they are deemed suitable for use in connecting terminal wires of motors, starting compensators and other electrical apparatus to supply mains where it is desirable to frequently disconnect such supply mains from the apparatus and where such connections are open to view. When so used, the joints must be well taped. Approved June 13, 1912.

Fig. 1.—Indirect-Lighting Fixture. National X-Ray Reflector Company.

FIXTURES.—National X-Ray Reflector Company, 1119 West Jackson Boulevard, Chicago, Ill.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, Inc., have labels attached to fixtures.

This manufacturer is equipped to supply these fixtures so labeled.
Approved May 3, 1912.

FIXTURES.—The Albert Sechrist Manufacturing Company, 1033 Sixteenth Street, Denver, Colo.

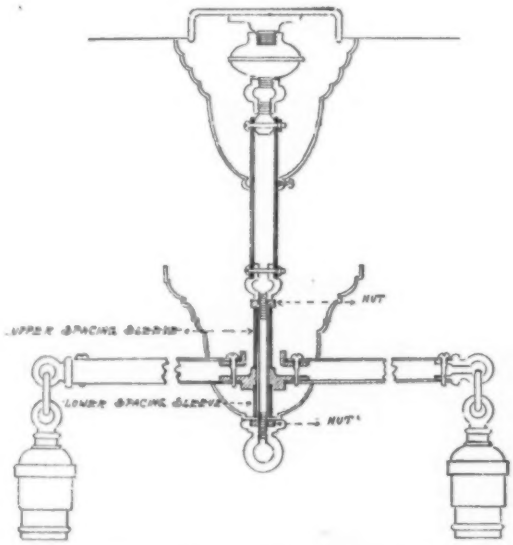


Fig. 2.—Sechrist Patent Electrolier. The Albert Sechrist Manufacturing Company.

"Sechrist Patent Electroliers."

Straight electric fixtures designed to be readily wired and assembled. Arms or stems are made of either round or square tubing. These fixtures have standard bodies and stock arms of various designs.
Approved May 22, 1912.

FLEXIBLE CORD.—The Bay State Insulated Wire & Cable Company, River Street, Hyde Park, Mass.

Marking: One black thread under the braid parallel with the rubber.

Standard—National Electrical Code, 1911 Edition.
Approved May 20, 1912.

INSULATING JOINTS.—The Macallen Company, Macallen and Foundry Streets, Boston, Mass.

Special high-tension insulating joints designed to withstand an 8,000-volt test.
Approved May 17, 1912.

RECEPTACLES, STANDARD.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant New Wrinkle" Wall Sockets having cleat bases.

Double pole, key, Catalog Nos. 4534, 4535.

Fig. 3.—"New Wrinkle" Socket. The Bryant Electric Company.

Single pole, key, Catalog No. 7534.
Single pole, keyless, Catalog No. 7535.
Approved June 13, 1912.

SIGNS, ELECTRIC.—Empire Electric Sign Company, 162-164 East Eighteenth Street, New York, N. Y.

Electric Signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have standard labels attached to each sign. This company is equipped to supply these signs labeled.
Approved June 3, 1912.

SOCKETS, STANDARD.—Weber Electric Company, Schenectady, N. Y.

Pull, 250 watts, 250 volts, Catalog Nos. 1510-1527 inclusive.
Approved May 13, 1912.

Fig. 4.—"New Wrinkle" Base. The Bryant Electric Company.

WIRES, RUBBER COVERED.—Canadian General Electric Company, Limited, 14-16 King Street, Toronto, Canada.

Marking: Two diametrically opposite ridges on insulation running lengthwise on the wire.

National Electrical Code, 1911 Edition.
Approved April 26, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

COLEMAN, TEX.—The city contemplates the construction of an electric light plant.

NEW HOLSTEIN, WIS.—This town has voted in favor of establishing a municipal lighting plant.

SKIATOOK, OKLA.—The city has voted a $3,000 bond issue for the construction of an electric light plant.

MASCOT, TENN.—American Zinc Company, it is stated, will build a hydroelectric plant on the Holston River.

HALEYVILLE, ALA.—This city will expend $20,000 on electric light and waterworks construction. M. S. Drewry is town clerk.

NEWPORT, CAL.—The city will soon issue bonds in the sum of $64,000 for the installation of an electric light and power plant.

SAGINAW, MICH.—The Frankenmuth Power & Light Company has filed articles of incorporation with a capital stock of $60,400.

SAVANNAH, GA.—The Great Eastern Lumber Company will build an electric light plant. C. E. Gill is vice-president of the company.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company is going to build a transmission line from Salt Lake City to Bingham.

GREERS, S. C.—The city has retained the services of J. B. McCarthy Company, Atlanta, Ga., to prepare plans for electric light improvements.

HALLS, TENN.—James Z. George, of Memphis, has purchased the plant of the Halls Light, Water & Ice Company and will make improvements.

WASHINGTON, D. C.—Washington & Great Falls Railway & Power Company has under consideration building a power station at Great Falls.

LENOIR CITY, TENN.—The Conservation Marble Company will open a large quarry near this city. All of the machinery will be electrically operated. G.

HILLSBORO, TEX.—The Texas Power & Light Company is making plans for the rebuilding of its plant at this place. The estimated cost will be $30,000.

CLINTON, KY.—The Clinton Water & Light Company has been organized with $15,000 capital stock by Thomas Emerson, P. H. Porter and others. G.

WARRENSBURG, MO.—State Normal School will construct electric light system. Worley & Black, consulting engineers, Kansas City, are preparing the plans.

SALIDA, COLO.—Lightning struck the station of the Salida Light, Power & Utility Company on July 1, setting fire to the building and burning out a transformer. The loss will be about $1,800.

TRINITY, TEX. — The electric light plant at this place, owned by A. R. McDonald, which was recently destroyed by fire, will be replaced by a new plant. D.

GUNTERSVILLE, ALA.—This city has retained the services of J. B. McCrary Company, of Atlanta, Ga., to prepare plans for the construction of an electric light plant.

DECATUR, GA.—This town has under consideration issuing $15,000 in bonds for the erection of a municipal electric light plant. The mayor has the matter in charge.

DESHLER, NEB.—The Deshler Light & Power Company expects to install an electric light plant in this town. The principal stockholders are the Bokankamp brothers.

ST. LOUIS, MO.—The Mississippi River Distribution Company will build a $75,000 substation at Wellston. Power from the Keokuk development will be distributed from this station.

SANTA BARBARA, CAL.—Bids will be received up to July 22 for a franchise granting right to maintain an electric tower, pole and wire system on the public highways.

LOS ANGELES, CAL.—The Los Angeles & Silver Lake Power & Irrigation Company is trying to get possession of a power location capable of developing 40,000 horsepower.

JOHNSTOWN, N. Y.—A municipal lighting plant for this town is receiving considerable attention from the aldermen. An estimate of $50,000 has been made for the size of plant required.

PHOENIX, ARIZ.—The Kelvin-Sultana Mining Company will erect a power plant on the Gila River opposite the town of Kelvin, and transmit power to its mines. Neil McMillen is superintendent.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has asked permission to run a transmission line from Bear Creek in Plumas County to its northern tower on the Straits of Carquinez.

SIMPSONVILLE, KY.—The Lincoln Industrial Institute, of which A. E. Thompson is president, has under consideration the construction of an electric light and power plant, to cost about $10,500.

NORTH ADAMS, MASS.—The New England Power Construction Company has decided to enlarge plant No. 5, near the Hoosac Tunnel. The ultimate development will amount to 12,000 horsepower.

IRVINE, KY.—The Estill General Utilities Company has been incorporated with $2,500 capitalization and will probably erect a lighting plant. W. H. Lilly, J. F. West, T. Wallace and others are the incorporators. G.

SPOKANE, WASH.—Bids will be received up to July 16, on the revised plans for the Second Avenue electrolier lighting system. The estimated cost of the system is $54,485.23, of which $9,365 is for the lamp-posts.

RICHMOND, MINN.—A franchise has been granted to the Minnesota Power Company of St. Cloud to furnish electric lighting in this village. The intervening villages of Rockville and Cold Springs will also be supplied.

TEMPLE, TEX.—The Texas Light & Power Company has secured the franchise for electric lighting in this town. The company will build a mammoth power plant at Waco and transmit power to all the surrounding towns.

FITCHBURG, MASS. — Petitions have been filed by business men and residents in two different sections of the city calling for the installation of tungsten cluster lampposts. The people are very insistent and the improvements are likely to be made very soon.

SEATTLE, WASH.—The city is about to obtain control of several water-power sites in the vicinity for increasing the power supply of Seattle. New transmission lines to the city will be built as soon as power houses have been provided for.

PARKSVILLE, TENN.—The Eastern Tennessee Power Company is about to construct a water-power plant on the Ocoee River near here. A contract for the structural steel work has been awarded to the Converse Bridge Company, of Chattanooga, Tenn. G.

COLORADO SPRINGS, COLO.—The Intermountain Railway, Light & Power Company has been incorporated with a capital stock of $2,000,000 for the purpose of conducting a general railway, light and power business in Colorado, Texas, Wyoming and New Mexico.

SEABREEZE, FLA.—Funds have been raised for installing 100-watt tungsten lamps along Valley Street and Halifax Avenue. The contract for lighting will be arranged with the local electric light company. The affair is in the hands of the Improvement Club, of which the chairman is A. T. Bigelow.

TRENTON, N. J.—The Jersey Industrial Company has been incorporated with a capital stock of $1,000,000 with the object of developing water, electric and power plants for industrial purposes. The incorporators are Albert H. Clarke, of Brooklyn; Frank B. Shannon, of Wilkinsburg, Pa., and Harry A. Oetien, of Jersey City.

MEMPHIS, TENN.—The construction of additional "white ways" is planned by property owners on Union Avenue, following the completion of plans for the installation of ornamental lighting facilities on Madison Avenue. Petitions providing for the widening of Union Avenue are being circulated.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SAN ANTONIO, TEX.—F. L. Mesch will construct a telephone line in this vicinity.

NEW MINDEN, ILL.—The New Minden Telephone Company has increased its capital stock from $2,490 to $5,000.

RIVES, TENN.—A telephone company will be organized here by E. L. Powers, T. B. Clement, Mayor McNail and others.

YSLETA, TEX. — The Tri-State Telephone Company is to establish a telephone exchange in this town and will run a line to El Paso.

BLACKDUCK, MINN.—A telephone company has been organized by the Blackduck Farmers' Club to build a line to Whitefish Junction.

SAN BERNARDINO, CAL.—All points between this city and Inyo County are to be connected by the Interstate Telephone Company.

ZAPATA, TEX.—Zapata will shortly be connected with Laredo by telephone. At present the town has neither telegraph, telephone nor railroad.

WICHITA, KANS.—There is an agitation for establishing an automatic telephone exchange in this city. Local capitalists are negotiating for a new plant.

PASADENA, CAL.—The Home Telephone Company has been granted a 40-year franchise for a telephone and telegraph system, work to begin within thirty days.

STRATHMORE, CAL.—The Magnolia Telephone Association has been organized here with N. A. Clifford as president, and H. M. Stritzman as secretary and treasurer.

ST. JOHNSBURY, VT.—The Passumpsic Telephone Company will place all of their wires underground as fast as possible and will also put some of their wires into cables.

NAVASOTA, TEX.—The Yarbrough Telephone Company has been incorporated with a capital stock of $6,000. The incorporators are G. C. Stoneham, J. M. McGinty and R. N. McGinty.

SPRINGDALE, KY.—Springdale & Tollesboro Mutual Telephone Company has been organized to construct a telephone system from Springdale to Tollesboro. Landon Hull is president of the company.

RIPLEY, TENN.—Union Telephone Company has been incorporated by J. A. Porter, J. A. Johnson, J. R. Lewis, A. I. Dorsey and J. W. Sanford for the purpose of operating a telephone system from Gold Dust to this place.

LITTLE ROCK, ARK.—The Johnson County Telephone Company of Clarksville has filed articles of incorporation with the Secretary of State. The company is capitalized at $15,000. The incorporators are Edward Cronk, C. J. Farnsworth and S. H. Logan.

PASADENA, CAL.—Plant Engineer W. D. Moore considers that the two systems of the Pacific Telephone & Telegraph Company and the Home Telephone & Telegraph Company are so nearly equal in size that it will be impossible to throw them into one exchange. Temporary connection must be established by placing cables between the two offices. Cost will be $25,000.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PROVIDENCE, R. I.—The Boston & Providence Interurban Railway will shortly begin construction.

VANCOUVER, WASH.—The electric railway is to be extended to Hockinson, a distance of about six miles.

KENTON, O.—The Columbus, Urbana & Western Electric Railway will be extended to Dublin, a distance of 11 miles.

CENTERVILLE, IOWA. — The Southern Iowa Traction Company is planning to extend its system in Centerville.

MIDDLETOWN, O.—The Cincinnati, Reading & Middletown Traction Company proposes to build a new line to this city.

CORPUS CHRISTI, TEX.—A franchise has been granted to the Corpus Christi Traction Company to extend its line in this city.

LOS ANGELES, CAL.—Work will begin soon on the electrifying of the Southern Pacific line between Santa Ana and Newport Beach.

NASHVILLE, TENN.—It is proposed to extend the Nashville-Gallatin Interurban Railway to Bowling Green and Franklin, Ky.

DAYTON, O.—Directors of the Dayton & Troy Traction Company have authorized a number of substantial improvements along their line.

SACRAMENTO, CAL.—The Oakland-Antioch Railroad Company and the Central California Traction Company have been granted franchises.

DAYTON, O.—Local business men are interested in the movement to construct a railway line between Covington and Loramie, 17 miles in length.

RICHMOND, VA.—The Richmond & Henrico Railway Company has been granted a 15-year franchise for street railway extension and light and power service.

CENTERVILLE, IOWA. — The Southern Iowa Traction Company expects to obtain a franchise to extend its tracks in this town. The line connects with Albia.

LOS ANGELES, CAL.—The Pacific Electric Company and the Los Angeles Railroad Company will start work soon on a third-rail system on San Pedro Street.

BARTLESVILLE, OKLA. — The Bartlesville Interurban Railway Company will build an extension of its road from Dewey, Okla., to Caney, Kas., a distance of 30 miles.

FARGO, N. D.—A 25-year franchise has recently been granted to the Fargo & Moorhead Street Railway Company under the condition it commence work on construction at once.

HAMILTON, ONT.—The Hamilton, Waterloo & Guelph Electric Railway Company is preparing to build an electric line from Hamilton to Guelph and from Hamilton to Toronto.

ST. PAUL, MINN.—An electric line to Hastings is a probability of the near future. The Association of Commerce is considering a proposition of raising the necessary guarantee funds.

ALBANY, N. Y.—The Albany Southern Railroad will extend its lines from Schodack Point to the Massachusetts state line, where it will connect with the extension of the Pittsfield street railway.

GRAND RAPIDS, MICH.—The Grand Rapids, Grand Haven & Muskegon Interurban Line will double-track a considerable portion of its road extending west from Grand Rapids.

GRAFTON, W. VA.—The Fairmont, Clarksburg & Grafton Traction Company has decided to build from Grafton to Clarksburg, it is stated. This branch will be about 20 miles long.

COLUMBIA, MO.—It is proposed to build an electric railway from this town to Prathersville, running through the coal district of Boone County. The Commercial Club is backing the movement.

HUTCHINSON, KANS.—The Hutchinson & Western Interurban Railway Company has secured a franchise in this town and will build a line through Enterprise, Huntsville and Hayes townships.

COLUMBUS, O.—The Columbus, Newark & Zanesville Electric Railway Company has been granted authority to issue $250,000 worth of bonds for the purpose of making improvements and for paying for the work already done.

FAIR PLAY, MO.—It is proposed to construct an electric interurban line from Lebanon to Nevada, passing through Buffalo, Bolivar, Fair Play, Stockton and Jerico Springs. The project is being promoted by Thompson Brothers of Kansas City.

PATALUMA, CAL.—Residents of Cotati, a suburb of this city, have inaugurated a movement for the construction of a new electric line from this city to Santa Rosa by way of Cotati. The Pataluma & Santa Rosa Railway Company will probably build the line.

KANE, PA.—An electric railway connecting this city with Mt. Jewitt, 12 miles distant, is to be built in the near future. Another branch will extend to James City, a distance of three miles. The movement is backed by J. C. Bell and W. M. Rohn, two capitalists of Jamestown, N. Y.

CINCINNATI, O.—The Indianapolis & Cincinnati Traction Company will extend its line to this city. Three routes have been surveyed, and are now under consideration. One from Rushville, one from Connersville, and one from Greensburg. Charles L. Henry of Indianapolis is president of the company.

SAN ANTONIO, TEX.—The District Court of San Antonio has authorized Will A. Morris, receiver of the Terrell Well Company, to issue $57,000 worth of receiver's certificates, the proceeds of which shall be used to complete the construction of the electric street railway to Terrell Well. D.

PORTLAND, ORE.—The Southern Pacific Railroad Company is planning to spend between $18,000,000 and $28,000,000 on improvements in the Pacific Northwest within the next two years. The plans embrace a modern office building in Portland, a steel bridge across the Willamette River, a four-track system between Oswego and Aurora and electrification of 340 miles of road.

JOHNSON CITY, TENN.—E. M. Runnels, of the Bristol Board of Trade, is negotiating with the recently organized Johnson City Traction Com-

pany for the construction of a 25-mile line connecting the two cities. The Johnson City company took over the street-railway system there. It will be served in the near future from a power plant on the Nolachucky River, which will make the operation of an interurban line less expensive than it would otherwise be.

LAWTON, OKLA.—Acceptances of the street railway and electric lighting franchises recently granted by the city commissioners have been filed by B. R. Stephens, of McAlester, president of the company formed recently to take over the properties of the defunct Lawton & Fort Sill Electric Railway and the Comanche Light and Power Company. Actual construction on the interurban line will begin as soon as approval can be secured for the plats of the proposed line across the military reservation. It is now practically certain that before the plats are approved the company must agree to extend its line so as to give service to the old post. It is believed that the company will be willing to do this, but the change in plans may necessitate some delays. P.

PROPOSALS.

ELECTRICAL RECORDING THERMOMETER.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until July 16, for one electrical recording thermometer to be delivered at the Navy Yard, Washington, D. C., as per Schedule 4653.

ELECTRIC EQUIPMENT.—Sealed proposals will be received at the office of the United States Engineer, 540 Federal Building, Buffalo, N. Y., until August 5 for furnishing and installing electric power and light lines and fixtures and telephone lines. Further information may be obtained upon application.

ELECTRIC CONDUITS AND WIRING AND LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 16 for electric conduits and wiring and lighting fixtures of a two-story building for the post office at Franklin, La. Drawings and specifications may be obtained from the custodian of the site or from the office of the Supervising Architect.

DISTRIBUTING SYSTEM.—Sealed proposals indorsed "Proposals for Underground Distributing System" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until August 3 for installing complete an underground distribution system for electric light, power and telephones at the Naval Academy, Annapolis, Md. Plans and specifications may be obtained by applying to the Bureau or to the Superintendent of the Naval Academy.

NAVY DEPARTMENT.—The Bureau of Supplies, and Accounts, Navy Department, Washington, D. C., will open bids on August 6 for the material in the following table. Bidders interested should apply for the schedule numbers desired.

Article.	Quantity.	Delivery at navy yard.	Sch.
Blowers, centrifugal, motor-driven	2	Puget Sd., Wash.	4690
Cable, twin conductor, armored	2,000 feet	Brooklyn, N. Y.	4698
Cord, incandescent, lamp	50,000 feet	Brooklyn, N. Y.	4698
Earpieces, rubber	300	Puget Sd., Wash.	4704
Motor, induction	1	Norfolk, Va.	4705
Railway, industrial equipped	1	Puget Sd., Wash.	4690
Wire, copper, trolley	1,000 pounds	Brooklyn, N. Y.	4698

LIGHTING FIXTURES—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until July 24, for furnishing and installing lighting fixtures in the new United States post office at New York, N. Y., in accordance with drawings and specification, copies of which may be obtained at the office of the Supervising Architect.

NEW INCORPORATIONS.

DES MOINES, IOWA.—Home Electric Company, of Burlington; capital, $10,000

MENARD, TEX.—The Menard Public Service Company. Capital, $75,000. Incorporators: J. L. Clark, J. L. Clark, Jr., S. Crow.

CAMBRIDGE, WIS.—Cambridge Light & Power Company. Capital, $7,000. Incorporators: A. C. Amundson, H. C. Stair, J. W. Porter.

MONMOUTH, ILL.—Monmouth Gas and Electric Company; capital, $10,000; incorporators John Heron, Oscar O. Mertz, E. P. Seibt.

CLINTON, KY.—Clinton Water & Light Company; capital $15,000. Incorporators: Thomas Emerson, J. L. V. Grenier and P. H. Porter.

HOWARD, TEX.—The Howard Water and Light Company; capital stock $5,000. Incorporators: J. T. Murphey, W. R. Woods, J. S. Robinson and others.

SANTA CRUZ, CAL.—The Santa Cruz Electrical Supply Company has been incorporated with $6,000 capital stock by C. H. Fredson, C. E. Glaine and M. L. Fredson.

CLEVELAND, O.—The Caxton Power Company. Electric light and power, steam; $10,000. Harry W. Slack, C. F. Wolcott, Edmond Griere, A. B. Lapham and W. Weidenthal.

EL PASO, TEX.—Southwestern Electric and Machine Company; capital stock $8,000. Incorporators: Robert McGarraugh, E. E. Slaughter, M. F. Crossette and J. H. Knost.

PETERSBURG, IND.—Pike County Electric Light and Power Company; capital stock, $15,000; directors, W. D. Hodson, W. T. McCosky and W. F. Seager, all of Lansing, Mich.

HELENA, MONT.—Harlem Electric Light & Power Company. Incorporators: Peter Mitchell, D. A. Ring and Mae E. Mitchell. Capital, $10,000 of which $6,000 has been subscribed.

CHICAGO, ILL.—McFell Signal Company; capital $50,000; manufacturing and installing all kinds of electrical appliances; incorporators, Judson McFell, Charles Greve, Willis Smith.

NEW YORK, N. Y.—The Austrich Arc Lamp Company has been incorporated with a capital stock of $20,000 for the purpose of manufacturing arc lamps, etc. The incorporators are John C. Tomlinson, Jr., Bruno Rothschild and Max Austrich, all of New York City.

HOPKINSVILLE, KY.—Christian-Todd Telephone Company; capital $1,000,000. Incorporators: R. E. Cooper, F. G. Hoge, J. B. Hoge and R. E. Hastings. This company will take over the properties of the Cumberland Telephone and Telegraph Company and The Home Telephone Company, making physical connection between them.

AUGUSTA, ME.—The General Gas & Electric Company has been organized with a capitalization of $20,000,000 in common and preferred stock and $20,000,000 in bonds. This company which is controlled by W. S. Barstow & Company, will take over the Vermont Power, Railway & Light Company and the Northwestern Ohio Railway & Power Company.

HARRISBURG, PA.—Charters for 17 electric companies, to operate in Allegheny and Washington counties, have been granted to two groups of men. Julius Theobald, W. D. Anderson and H. P. Carr have incorporated companies to operate in Dormant, Hays, Jefferson, Mifflin, Union, Snowden, Wilson, and Upper St. Clair townships. J. M. Ralston, C. M. Brownlee and J. C. Cockins incorporated companies to operate in Canton, North Strabine, South Strabine, Cecil, Houston, Washington, Chartiers, Canonsburg and East Washington townships. All of the companies will have offices in Pittsburgh.

FOREIGN TRADE OPPORTUNITY.

(Parties interested in the following item should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

NO. 9148. ELECTRIC POWER PLANT.—A leading business man in a foreign country, who is expected to attend a congress to be held shortly in the United States, is in the market for an electric power plant capable of illuminating a town of 7,000 inhabitants.

FINANCIAL NOTES.

The mixed political situation has brought about a considerable apprehension upon the part of those who are in the securities market as a result of a study of fundamentals, and there is much concern over the action that will be undertaken by manipulators of security prices. While much may be said of the underlying soundness of industrial and crop conditions, it is by no means possible that politics can be entirely ignored. The outlook seems to point to no decided movement in prices for some time to come.

D. W. Call resigned as one of the receivers of the Allis-Chalmers Company to accept the presidency of Hale & Kilburn Manufacturing Company. Otto H. Falk, of Milwaukee, now sole receiver of the company, is described by his friends as a man than whom there is no better for present receivership and eventual presidency of Allis-Chalmers Company. June bookings of the company were the largest for any month in years. Excluding a large order from United States Steel Corporation, bookings were larger than for any month in two years. Business of the company has been showing a steady gain since default on the bonds in January.

The Nevada-California Power Company has sold $2,000,000 first mortgage twenty-five-year, six per cent sinking-fund bonds of the Southern Sierras Power Company to Chicago bankers. The bonds are unconditionally guaranteed principal and interest, by the Nevada-California Power Company.

For the first three months of the fiscal year net earnings of the Westinghouse Electric & Manufacturing Company ran at the rate of nearly fifteen per cent on the common stock compared with six per cent last year and 12.3 per cent for 1911, the best year since the reorganization in 1907. The company is operating its plants at the highest possible percentage of capacity, employing every available man and still reporting a shortage of labor.

The Consumers Power Company, of St. Paul, controlled by H. M. Byllesby & Company, of Chicago, who, recently bought control of Minneapolis General Electric Company from the Stone-Webster Company of Boston, filed a trust deed at Stillwater for $5,000,000 to secure a second mortgage on the company's properties in Minnesota and the Dakotas in favor of Standard Trust Company, of New York. The move is preliminary to the combining of Consumers Power and Minneapolis General Electric Company under one management and in one operating system.

Massachusetts Electric Company closed its fiscal twelve months on the last day of June with a gain in gross for the month of $60,000, or seven and two-thirds per cent. For the full twelve months the Massachusetts Electric system has shown an expansion in gross income of $308,700, a gain of 3.5 per cent compared with a 1911 increase of $320,571, or 3.7 per cent. The $308,700 increase in gross for the twelve months means that operating revenue this year will cross the $9,000,000 mark, the exact figures being slightly in excess of $9,175,000. It has taken Massachusetts Electric three years to go from $8,000,000 to $9,000,000 gross. The average annual gain of the system since organization has been about 4.7 per cent. If that ratio holds during the next two years a prediction of $10,000,000 total income for the 1914 year will become a reality.

Dividends.

American Light & Traction Company; a quarterly preferred dividend of 1.5 per cent, and a common dividend of 2.5 per cent; also a common stock dividend of 2.5 per cent; all payable August 1 to stock of record July 17.

Brooklyn City Railroad; the regular quarterly dividend of two per cent, payable July 15 to stock of record July 1.

Commonwealth Edison Company; the regular quarterly dividend of 1.75 per cent, payable August 1 to stock of record July 15, including first, second and third installments of subscriptions paid for whole shares not yet issued.

Commonwealth Power, Railway & Light Company; a quarterly dividend of 1.5 per cent, payable August 1 to stock of record July 19.

East St. Louis & Suburban Railway Company; a quarterly preferred dividend of 1.25 per cent, payable August 1 to stock of record July 15.

El Paso Electric Company; a semiannual preferred dividend of three per cent, payable July 8 to stock of record July 1.

Manchester Traction Light & Power Company; a quarterly dividend of two per cent, payable July 15 to stock of record July 1.

Mexico Tramways; a quarterly dividend of 1.75 per cent, payable August 1 to stock of record July 13.

Mexican Light & Power Company; a quarterly common dividend of one per cent, payable July 15 to stock of record, July 5.

Milwaukee Electric Railway & Light Company; a quarterly preferred dividend of 1.5 per cent, payable July 31 to stock of record July 20.

Mountain States Telephone & Telegraph Company; a quarterly dividend of 1.75 per cent, payable July 15 to stock of record June 29.

New Hampshire Electric Railways; a semiannual preferred dividend of two per cent, payable August 1 to stock of record July 20.

Railway & Light Securities; a semiannual common dividend of two per cent, and a preferred dividend of three per cent, both payable August 1 to stock of record July 15.

United Traction Company; the regular semiannual dividend of 2.5 per cent on preferred stock, payable July 20 to stock of record July 10.

Western States Gas & Electric Company; a quarterly preferred dividend of 1.75 per cent, payable July 15 to stock of record June 29.

York Railways Company; a semiannual preferred dividend of two per cent, payable July 22 to stock of record July 10.

Reports of Earnings.

RICHMOND LIGHT & RAILROAD.

The report just issued by the New York Public Service Commission of the operations of the Richmond Light & Railroad Company, for the year ended December 31, 1911, shows a continuance of the improvement in earnings of that company. Since 1909 the company has steadily improved in earnings, and has been able to cut down the profit and loss deficit from $134,903 as of June 30, 1909, to $32,213 as of December 31, 1911.

The income account for the year ended December 31, 1911, compares with that of December 31, 1910, as follows:

	1911	1910	Changes
Operating revenue, Light department	$402,421	$376,845	$25,576
Operating revenue, Railroad department	362,033	341,141	20,891
Total gross	764,454	717,986	46,467
Net, after taxes	177,454	173,751	3,703
Other income	7,377	6,734	643
Total income	184,831	180,485	4,346
Charges, etc.	116,184	116,167	17
Surplus for year.	*68,647	64,318	4,329

*Equal to 2.4 per cent on $2,871,750 capital stock.

The company has recently made additions and improvements to its property, the cost of which was charged to operating expenses.

LAKE SHORE ELECTRIC.

The Lake Shore Electric Railway Company reports for May and eleven months ended May 31, compared as follows:

	1912	1911
May gross	$107,139	$105,322
May net	43,586	50,892
Surplus after charges	8,897	16,308
Eleven months gross	466,336	444,636
Eleven months net	172,099	189,688
Deficit after charges	1,637	*16,291

*Surplus.

NORTHERN OHIO TRACTION & LIGHT.

The Northern Ohio Traction & Light Company reports for May and eleven months ended May 31, compared as follows:

	1912	1911
May gross	$255,104	$228,693
May net	112,299	104,037
Surplus after charges	68,479	59,708
Eleven months gross	1,100,375	977,579
Eleven months net	462,033	415,538
Surplus after charges	242,925	193,764

DETROIT UNITED RAILWAY.

The Detroit United Railway Company reports as follows for May and five months ended May 31:

	1912	1911
May gross	$980,034	$889,442
May net	379,671	348,694
Other income	15,548	13,688
Total income	395,219	362,382
Charges and taxes	175,635	176,148
May surplus	219,584	186,234
Five months gross	4,363,671	3,874,799
Five months net	1,536,868	1,412,021
Other income	81,828	68,972
Total income	1,618,696	1,480,994
Charges and taxes	889,852	880,099
Five months surplus	728,844	600,895

HOUGHTON COUNTY TRACTION.

The Houghton County Traction Company, Houghton, Mich., reports for the year ended April 30:

	1912	1911
Gross earnings	$300,688	$306,123
Net earnings	122,692	124,655
Net income	60,087	61,505

The company does an electric railway business in Houghton and Keweenaw counties, Mich., connecting a number of towns in the copper mining district of the state. It serves a population of about 72,000. It operates thirty-two miles of line.

GRAND RAPIDS RAILWAY COMPANY.

The Grand Rapids (Mich.) Railway Company reports for April and for the four months ended April 30:

April:	1912	1911
Gross earnings	$ 94,339	$ 89,967
Net earnings	39,148	35,619
Surplus	24,633	20,581
Four months:		
Gross earnings	$382,013	$353,576
Net earnings	162,133	147,822
Surplus	103,501	87,496

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 8.	July 1.
Allis-Chalmers common (New York)	¼	1⅜
Allis-Chalmers preferred (New York)	1¾	4½
American Tel. & Tel. (New York)	145¼	144⅞
Commonwealth Edison (Chicago)	139	139
Edison Electric Illuminating (Boston)	293	291
Electric Company of America (Philadelphia)	*12¼	*12¼
Electric Storage Battery common (Philadelphia)	55½	55½
Electric Storage Battery preferred (Philadelphia)	55½	55½
General Electric (New York)	180	177
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	19½	19½
Manhattan Transit (New York)	1⅞	2
Massachusetts Electric preferred (Boston)	93	*92
National Carbon common (Chicago)	115	113
National Carbon preferred (Chicago)	118	118
New England Telephone (Boston)	153	153
Philadelphia Electric (Philadelphia)	22⅛	22½
Postal Telegraph and Cables common (New York)	88½	88⅞
Postal Telegraph and Cables preferred (New York)	69	68½
Western Union (New York)	82	82¾
Westinghouse common (New York)	77	76
Westinghouse preferred (New York)	*118	118

*Last price quoted.

PERSONAL MENTION.

JAMES A. BEUDURE, formerly connected with the Economy Light, Fuel & Power Company, Lockport, N. Y., has joined the contracting department of the American District Steam Company.

L. B. HERRINGTON, president of the Richmond Lighting Company, has been elected president of the Dix River Power Company, which is developing a large project in Central Kentucky.

L. W. WHITNEY, formerly general superintendent of the Central Union Telephone Company in Indiana has been appointed general manager of the company for Indiana with headquarters in Indianapolis.

W. A. MACGLAUCHLIN, who has been connected with the Bell Telephone Company in Altoona, Pa., for a number of years, as district plan supervisor, has resigned from this position to take up other business.

H. O. SEYMOUR has been made general manager of the Wisconsin Telephone Company. Mr. Seymour held this position until the reorganization in June, 1911, when he became general agent of public stations with headquarters at Chicago.

B. W. TRAFFORD, formerly vice-president and general manager of the Michigan State Telephone Company and latterly vice-president of the group of five Bell companies operated from Chicago, has been elected vice-president of the First National Bank of Boston.

C. E. WHITE, formerly connected with the Engineering Department of the National Electric Lamp Association, Cleveland, will in the future represent the Nelite Works of the General Electric Company in the states of Ohio and New York. H. G. Gainer will cover the Southern territory.

A. M. KLINGMAN, who, for some time past, has been connected with the Adams-Bagnall Electric Company, Cleveland, O., in the capacity of efficiency engineer, has returned to the engineering department of the National Electric Lamp Association to assume the position of assistant commercial engineer.

A. VON SCHLEGELL has been appointed general manager of the Michigan State Telephone Company with headquarters at Detroit. Mr. Von Schlegell was formerly general contract manager of the company, but a year ago was transferred to Chicago at the time of the reorganization of the Bell telephone interests.

BYRON T. GIFFORD, formerly associated with the Central Station Engineering Company, Chicago, has assumed the management of the General Engineering Department recently organized by the American District Steam Company. Arthur E. Duram and Charles A. Gillham will join Mr. Gifford in his new work.

L. A. BAUER, director of the division of terrestrial magnetism of the Carnegie Institution of Washington, has been invited to deliver the Halley lecture on "Terrestrial Magnetism" at the University of Oxford, England, in May, 1913. He was elected a fellow of the American Academy of Arts and Sciences at the annual meeting in May.

J. L. CRIDER, formerly with the Baltimore & Ohio Railroad Company and chief engineer of the New York, West Chester & Boston Railroad, has been engaged by J. G. White & Company, Inc., as construction superintendent on the Oakland, Antioch & Eastern Railway, which is an extension of the Oakland & Antioch Railway.

C. F. ZIEGLER, manager of the New York office of the Reynolds Electric Flasher Company, was a Chicago visitor last week. He reports the electric sign business to be in satisfactory condition with excellent prospects, however, for a decided increase in volume during the fall. The use of flashers for securing striking and effective displays is rapidly increasing in the East.

CHARLES FRANCIS BRUSH, of Cleveland, inventor of the electric arc lamp, has had the honorary degree of Doctor of Science conferred upon him by the Michigan University, his alma mater, from which he graduated in 1869. Dr. Brush then engaged in electrical engineering in Cleveland. Later he was honored by the French Government for his achievements in electrical science, and a few years ago he was awarded the Rumford medal by the American Academy of Art and Science.

W. W. FREEMAN, vice-president and general manager of the Klings County Electric Light and Power Company and of the Edison Electric Illuminating Company of Brooklyn, has become actively interested in several water-power and electrical developments in the South, and will become a director and an officer of the Alabama Interstate Power Company, which will operate such properties. Mr. Freeman retains his financial interests and official relations with the Brooklyn properties in which he has been actively identified for 23 years and general manager for seven years.

GEORGE T. MANSON, of New York City, while *en route* to the Seattle electric light convention on the train de-luxe from the East, called on his old-time friend, Henry Hine, in Colorado Springs, Colo. Twenty or more years ago they were members of the Election Committee of the first Electric Club in New York, but for many years had not met. In response to a purposely indistinct name sent in to his private office, Mr. Hine came out and inquired the nature of the business of his caller, whom he did not recognize. "Well," replied Mr. Manson, "it seems to me about time that we held a meeting of the Membership Committee of the Electric Club." One puzzled look, and then, "George, I am delighted to see you," and the balance of that day was devoted to something other than strict, stern duty by these two electrical friends, who had not seen each other for fifteen years. The other members of that early-day electrical committee were George Worthington (deceased), Henry D. Lyman and F. W. Toppan, Lieutenant in the United States Navy.

OBITUARY.

H. F. WEBER, director of the electrochemical institute of the technical school at Zürich, Switzerland, and professor of physics and electrical engineering, has died at the age of 69 years.

ROBERT J. KELL, manager of the Home Telephone Company, at Holland, O., and his son, Robert, Jr., were instantly killed when struck by a limited train on the Lake Shore road, last week.

WILLIAM J. SEFTON, director, secretary and general manager of the Consolidated Telegraph and Electrical Subway Company, died on July 7, after a ten days' illness at his residence in Brooklyn, N. Y. Mr. Sefton was born in Liverpool, England, in 1854, and came to this country in 1884.

ARTHUR J. MORGAN, secretary of the National X-ray Reflector Company, Chicago, Ill., died on July 5, of pneumonia, at his residence in Evanston, at the age of 39. Mr. Morgan was born in Los Angeles, Cal., in 1873 and went to Chicago in 1900. He was a member of the Illuminating Engineering Society, Chicago Brass Manufacturers' Association, Chicago Association of Commerce, etc. The kindliness of Mr. Morgan's disposition, his strength of character, and sterling honesty made him a host of friends, who, with his wife and two small children mourn his untimely departure.

ALBERT T. LEACH, of Chicago, a well known printer and publisher, was killed in an automobile accident near Valparaiso, Ind., on the morning of Thursday, July 4. He was the secretary of the Kenfield-Leach Publishing Company, and was interested in a number of class publications, including *Brick, Domestic Engineering* and *The Office Outfitter*. Although a young man, Mr. Leach had achieved considerable success as a publisher of class journals, and was the active head of one of the largest printing houses in Chicago, handling among many other technical publications, the mechanical department of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. He had a most engaging personality, was highly respected and greatly admired, and his death will come as a great shock to a host of friends and acquaintances.

NEW PUBLICATIONS.

ORGANIZATION IN ENGINEERING.—The University of Illinois has published in bulletin form the address of Henry M. Byllesby on "Organization in Engineering," which was delivered at the University on January 18, 1912.

KEOKUK POWER DEVELOPMENT.—The Mississippi River Power Company has issued Bulletin No. 6 describing the progress of the development of the hydroelectric project on the Mississippi River at Keokuk, Iowa. High water in the river has impeded progress on the main dam and trouble was experienced in the spring from the large quantities of ice in the river. It is expected that the work will be completed before ice breaks next spring, so that this trouble will not be repeated.

COPPER WIRE TABLES.—The Bureau of Standards, Washington, D. C., has issued Circular No. 31, which is a comprehensive set of tables for copper wire, prepared with the cooperation of the Standards Committee of the American Institute of Electrical Engineers. It contains a historical introduction; an explanation of the tables; 15 tables dealing with the properties of copper, wire gauges, and copper and aluminum wire; and four appendices dealing with the expression of resistivity, then density of copper, and calculations of resistance, etc. These tables are based upon the latest determinations of tempera-

ture coefficient, etc., and are probably the most accurate that have yet been published.

COAL PURCHASES.—Bulletin 41, which has just been issued by the United States Bureau of Mines, deals with "Government Coal Purchases Under Specifications." It was prepared by George S. Pope, engineer in charge of fuel inspection. At present most purchasing coal contracts consider the heating value of the coal and the composition as shown by analysis. The price is made to depend upon these values. The purpose is to explain the methods which the Government has found most satisfactory in the purchase of its coal.

ENGINEERING GRADUATES.—The Iowa State College of Agriculture and Mechanic Arts has published a directory of graduates of the Division of Engineering. This gives the individual records of nearly 1,200 graduates and a compilation of statistics as to the character of employments and incomes. This school endeavors to prepare men along business as well as along technical lines and believes that engineers should take places as managers and other executive officers rather than as draftsmen or designing engineers in subordinate positions. The directory is being distributed with the idea of showing young men who are making a selection of a profession what the engineering graduates of this college are doing.

CHICAGO ANNUAL REPORT.—The fifteenth annual report of the Department of Electricity of the City of Chicago, for the calendar year 1911, has been issued. In addition to a financial statement, the report gives full data of street lighting, fires and accidents from electrical causes, fire-alarm and police-alarm service and electrical inspection. The net cost of the department was over one million dollars. There were 397 employees, 12,581 street arc lamps were in operation during the year, the average cost per lamp being $33.94. Ten thousand additional lamps have been contracted for, which will give Chicago more arc lamps and more candlepower per square mile than any other city in the United States. There were 178 accidents during the year, of which 31 were fatal. The number of fires of electrical origin was 81, causing a total damage of $47,571.

DATES AHEAD.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 16-19.

Ohio Electric Light Association. Annual convention, The Breakers, Cedar Point, O., July 16-19.

International Association of Municipal Electricians. Annual convention. Peoria, Ill., August 26-30.

International Association for Testing Materials. Sixth congress, New York City, September 3-7.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 4-6.

Eighth International Congress of Applied Chemistry. Washington, D. C., September 4; New York, N. Y., September 6-13.

Illuminating Engineering Society, Annual convention, Hotel Clifton, Niagara Falls, Ont., September 16-19.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 16-21.

The 1912 Boston Electric Show, Mechanics Building, Boston, Mass., September 28-October 26.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 10-11.

The New York Electrical Exposition and Automobile Show. The New Grand Central Palace, New York City, October 9-12.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kans., October 17-19.

With the Electrical Manufacturers

The Elux Miniature Lamp Works of General Electric Company, New York City, has moved its offices from Bible House, Eighth Street and Fourth Avenue to 324 Lafayette Street. H. K. Annin is general manager of the works.

Sangamo Electric Company, Springfield, Ill., is distributing an interesting treatise on the use of ampere-hour meters with vehicle and stationary storage batteries. Curves and data are given which will prove of interest to central-station managers endeavoring to build up vehicle-charging loads.

Straight Filament Lamp Company, 125 West Forty-second street, New York City, has issued a booklet describing the Rayline lamp and various forms of Rayline reflectors. This is an efficient tubular incandescent lamp 12 inches long, which in connection with the special reflectors made for it is especially adaptable for desk, showcase, cashier and show-window lighting.

Crocker-Wheeler Company, Ampere, N. J., has published bulletin No. 151, which fully illustrates and describes the company's line of Remek distributing transformers. These are made in both the pole and subway types and in 18 sizes from 0.6 to 100 kilovolt-amperes. The bulletin not only points out their advantages, but also shows several steps in the process of assembling.

The Electric Fountain Company, 121 West Forty-second street, New York, N. Y., has been awarded the contract for electric fountains in the Hotel Statler, Cleveland, O., for which the architects were George B. Post & Sons; Howard Gould's estate, Fort Washington, L. I., for which the architects were Hunt & Hunt; J. H. Flagler's estate, Greenwich, Conn., for which the architect was Frank A. Moore; the West End Apartment House, New York City, for which the architects were Bing & Bing; and the Druid Hill Park, Baltimore, Md.

American District Steam Company, North Tonawanda, N. Y., has inaugurated a general engineering department which will be under the management of Byron T. Gifford, formerly associated with the Central Station Engineering Company of Chicago. The Chicago offices of the company have been moved from the Monadnock Block to the ninth floor of the First National Bank Building.

Dossert & Company, reports that the building at 242 and 244 West Forty-first Street, New York City, in which the company's factory is located, was quite seriously damaged by a fire during the night of July 2. Two of the lower floors were completely burned out, but the Dossert plant was injured only very slightly, and this will not interfere with the prompt filling of orders.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued a number of new bulletins. Bulletin No. 3221 is devoted to bipolar ventilated motors that are made in sizes from one-half to one-fourth horsepower and for 110 or 220-volt direct-current circuits. Bulletin No. 3312 describes electrically driven blowers for hot-air residence furnaces; these insure an effective circulation of the heated air to all parts of a house. Bulletin No. 3912 describes direct-current and alternating-current motors for operating sewing machines in factories, these are equipped with power transmitters, including friction disks and brake.

The Electric Storage Battery Company, Philadelphia, Pa., on July 1 opened a new Exide battery depot at 1329 Walnut Street, Kansas City, Mo. At this depot will be carried complete "Exide," "Hycap-Exide," "Thin-Exide" and "Ironclad-Exide" batteries for electric vehicles, as well as battery renewals and parts. There will also be carried in stock a complete line of the new Exide battery for automobile lighting and self-starting, as well as the standard Exide battery for gas-engine ignition. Including the new Kansas City depot, the Electric Storage Battery Company now has ten Exide depots, located in Philadelphia, New York, Boston, Cleveland, Chicago, St. Louis, Kansas City, Atlanta, Denver and San Francisco.

Record of Electrical Patents.

Issued by the United States Patent Office, July 2, 1912.

1,030,860. Electric Push Switch. E. Anderson, assignor to Perkins Electric Switch Co., Bridgeport, Conn. A push-button snap switch with a V-shaped rocker bar.

1,030,862. Advertising Cabinet. H. Baker, Birmingham, Ala. Has an electric lamp behind a movable translucent display strip.

1,030,869. Wreck-Raising Appliance. V. Buffulini and R. Rottenbacher, Trieste, Austria-Hungary. Includes an electrically lighted buoy.

1,030,872. Telephone Receiver. N. Church, Camden, N. J. Special magnetic system and a compound diaphragm.

1,030,879. Weighing-Scale. B. D. Emanuel, Anderson, Ind. Has an electrically illuminated index dial.

1,030,901. Electric Heating Device for Running Water. H. Lofquist, Stockholm, Sweden. Turning on the water simultaneously closes the heater circuit.

1,030,904. Electric Furnace for Smelting and Reduction of Ore. H. B. Lorentzen, Notodden, Norway. Has a bridge between its two hearths.

1,030,910. Ventilated Reflector. J. Meyer, assignor to G. F. Spencer, Newark, N. J. A lamp cluster with dome-shaped closed reflector has ventilating openings at its base and top.

1,030,915. Telephone Transmitter. G. R. Morris, Buffalo, N. Y., assignor of one-third to D. Z. Morris. The resistance element is secured to a fastening post imbedded in plastic material.

1,030,925. System of Operation for Synchronizing Recorders. E. O. Schweitzer, Chicago, Ill. The synchronism indicators are energized at the same time as the interconnecting control switches.

1,030,929. Process of Manufacturing Aluminum Nitride. O. Serpek, assignor to Societe Generale des Nitrures, Paris, France. A finely divided mixture with carbon is subjected to action of nitrogen while being passed over electric heating elements.

1,030,953. Electric Ignition Apparatus for Gas Burners. H. Wasserzier, Karlshorst, near Berlin, Germany. Includes a make and break device.

1,030,955. Electric Lamp and Supporting-Bracket Therefor. G. Williams, assignor to English & Mersick Co., New Haven, Conn. Connections are made through a pin in the bracket and a socket in the lamp.

1,030,961. Railway-Traffic-Controlling System and Apparatus. W. H. Arkenburgh, Westfield, N. J., assignor to Hall Signal Co. Includes a three-phase relay responsive to changes in phase.

1,030,969. Cable Support. O. W. Brenizer, Philadelphia, Pa. A cable hanger made from a hooked single piece of wire.

1,030,972. Process for Direct Nickeling of Aluminum or Alloys Containing Aluminum. M. Chirade and J. Canac, Paris, France. A chemical treatment is followed by electrodeposition at less than three volts.

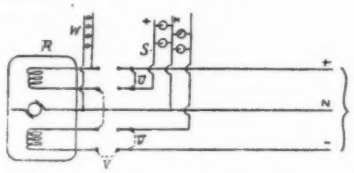
1,030,987. Extensible Electric-Light Bracket. F. L. Ellis, Milldale, Conn. A jointed bracket with the sections adapted to fold into each other.

1,030,999. Refractory Article and Method of Making It. S. F. Hall, assignor to Norton Co., Worcester, Mass. Refractory aluminum oxides are first melted in an electric furnace and then the mold is dipped into the molten mass.

1,031,009. Dynamo-Electric Machine. B. G. Lamme, assignor to Westinghouse Electric & Manufacturing Co. Includes a special arrangement of commutating poles.

1,031,016. Electric Device for Explosive Engines. C. T. Mason, Sumter, S. C. Relates to the drive for a magneto and an adjustable timer therefor.

1,031,026. Process for the Closing of the Seams of Tubes by Means of Electrical Resistance Welding. E. Presser, assignor to Gesellschaft für Elektrotechnische Industrie, M. B. H., Berlin, Germany. Includes a transformer which is energized from a direct-current source by continually reversing it and superposing the discharges from a condenser.



1,031,363.—Meter-Testing Service Cutout.

1,031,031. Electrical Switch. O. S. Walker, Worcester, Mass. A double-throw reversing knife switch whose secondary contacts are adjustable.

1,031,038. Electromotive Device. C. F. Burgess, Madison, Wis. A vibrator with a rectangular laminated core and an adjustable air gap surrounded by an alternating-current coil.

1,031,040. Electric Time Switch. S. Chiger, Berlin, Germany. Includes a disk with a guide path for a contact moved by one of the clock hands.

1,031,041 and 1,031,042. Recording Measuring Instrument. F. Conrad and P. MacGahan, assignors to Westinghouse Electric & Manufacturing Co. Has a parallel-motion recording mechanism actuated by solenoids.

1,031,076. Electric Lamp. W. J. Lusted, Los Angeles, Cal. Metal filaments are secured to a plate attached to an extension of the stern.

1,031,081. Electromagnetic Clutch. K. Miram and L. Seidel, Aachen, Germany. A shaft-coupling clutch that can be energized by direct current, single-phase, or polyphase current.

1,031,096. System of Control. H. A. Steen, assignor to Allis-Chalmers Co., Milwaukee, Wis. A pressure-control system with a double-throw switch and two auxiliary switches.

1,031,101. Lighting System. E. F. Wackwitz, assignor to Peerless Motor Car Co., Cleveland, O. A switch for controlling groups of automobile lamps.

1,031,114. Incandescent Electric Lamp. H. Gilmore, Brookline, Mass. A round-bulb lamp with metal filaments at right angles to the stem.

1,031,145. Fumigating Apparatus. C. A. Nye, Minneapolis, Minn. An electric fan blows air over a number of wicks that draw a vaporizable liquid from a tank.

1,031,169. Street-Car Advertising Sign. W. T. Childs, Springfield, Mass. An electrically illuminated sign.

1,031,191. Electric Foot Switch. C. A. Lundgren, assignor to Burroughs Adding Machine Co., Detroit, Mich. Depressing the treadle closes a spring switch.

1,031,204. Resistance Net. F. Schneiwindt, Neuenrade, Germany. Describes the method of weaving a heating pad.

1,031,205. Circuit-Breaker System. W. M. Scott, assignor to Cutter Electrical & Manufacturing Co., Philadelphia, Pa. Each of two circuits contains a circuit-breaker with differential coils connected to the two circuits and tending to open the breakers when either circuit becomes reversed.

1,031,241. Chandelier. S. G. Camp, Philadelphia, Pa., assignor of one-half to T. D. Hill. A folding electrolier permits the stem to be telescoped and the arms folded against the stem.

1,031,256. Attachment for Trolley Wheels. M. Goerman. Manorville, Pa., assignor of one-third to J. E. Callen. Semicircular guides are attached to the yoke.

1,031,257. Process and Apparatus for Extracting and Refining Metals and Alloys. A. E. Greene, Chicago, Ill. An electric furnace in which induced currents are set up in the molten metal.

1,031,262. Low-Water Alarm. A. G. Henry, Jr., De Smet, S. D. A metallic float engages circuit terminals.

1,031,292. Electric Self-Playing Violin. H. K. Sandell, assignor to Mills Novelty Co., Chicago, Ill. Includes an electromagnetic fingering device for the strings.

1,031,308. Automatic Starter and Lighter for Automobiles. W. G. Wordingham, assignor to Wordy Self Starter Co., Chicago. Permits controlling one sparking circuit independently of the other.

1,031,312. Circuit-Make-and-Break Device. A. A. Ziegler, assignor to United Electric Apparatus Co., Boston, Mass. Provides a special contact-key construction.

1,031,313. Electric Bell. A. A. Ziegler, assignor to United Electric Apparatus Co. Has a special armature construction,

1,031,316. Dynamo-Electric Machine. V. G. Apple, Dayton, O. Relates to the construction of the pole shoes.

1,031,324. Electric Switch. C. F. Cookson, Brooklyn, N. Y. Has a set of push-buttons, each operating on an independent contact piston.

1,031,336. Fire Alarm. A. Guenette,

Lachute Mills, Que., Canada. Includes a weight-operated clock-train medium for closing the circuit.

1,031,337. Feed-wire Connection for Electric Motors. G. J. Hartmann, White Plains, N. Y. Connections are made within a set of telescoping shells.

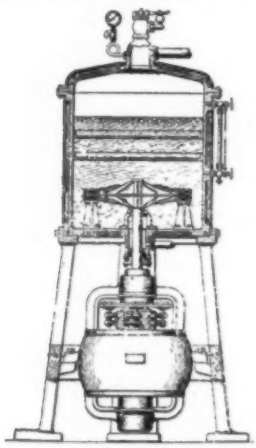
1,031,352. Electric Arc Lamp. J. C. Lincoln, assignor to **Lincoln Co.,** Cleveland, O. Provides a special feed mechanism for the upper carbon.

1,031,363. Meter-Testing Service Cutout. T. E. Murray, New York, N. Y. Has a gang plug for cutting the meter out of circuit and for connecting the service direct to the load.

1,031,382. Grid Resistance. F. L. Sessions, Columbus, O., assignor to Jeffrey Manufacturing Co. Relates to the method of supporting and interconnecting parallel grid elements.

1,031,383. Mail-Lift. P. J. Sheehan and T. W. McMahon, New York, N. Y. Is electrically operated and controlled.

1,031,387. Alternating-Current Switch.



1,031,489.—Electromechanical Water Heater.

F. W. Smith and L. Larsen, New York, N. Y. An electromagnetic toggle switch.

1,031,395. Game Apparatus. L. O. Sutton, Wilmington, Del. Includes a dial with electric contacts.

1,031,399 and 1,031,400. Operating Cord or Chain for Switches. A. A. Tirrill, Schenectady, N. Y. Describes means for detachably connecting the cord to the pull-switch mechanism, also the means for securing a ball to the chain.

1,031,401. Chain or Cord Coupling. A. A. Tirrill, Athens, Pa. The ends of the coupling are bent over and slotted to engage the end links of the pull chain.

1,031,408. Electrical Recording Apparatus or Indicator. J. L. Zander, Irvington, N. J. Has a coil encircling the curved pole piece and movably arranged thereon.

1,031,442. Rat Trap. H. Haxton, Starford, Pa. A bait trough is connected to one side of a circuit and a tread plate to the other.

1,031,443. Electric Iron. W. Heaviside, Davis, Cal. Above the heating element is asbestos packing and on its sides is a vacuum chamber.

1,031,453. Insulator. H. Lange and F. Druckenmuller, assignors to Franz Clouth Rheinsche Gummiwaarenfabrik M. B. H., Cologne-Nippes, Germany. A strain insulator with a metallic barlike core incased in insulation.

1,031,457. Electrical Controlling Mechanism. C. G. Lohay, Paris, France Has a motor-operated indicating mechanism, circuit-makers and circuit-breakers.

1,031,479. Oil Switch. H. L. Smith, assignor to General Electric Co. A solenoid-operated alternating-current switch.

1,031,488. Game Apparatus. L. B. Taylor, Lynnfield, Mass. Has electric lamp indicators to show the force of a blow.

1,031,489. System of Heating. E. Thomson, assignor to General Electric Co. A closed tank contains an impeller driven by an electric motor; in the tank are also means for impeding the water circulation and therefore converting its energy into heat.

1,031,492. Electric Animal and Insect Exterminator. C. C. Tuch, Honolulu, Hawaii. A box is provided with spaced electrodes.

1,031,500. Electric Meter. R. A. Willson, Spokane, Wash., assignor of one-half to H. L. Bleecker. A maximum-demand recording instrument.

1,031,529. Block-Signaling System and Safety Apparatus. M. Conrad, assignor of one-fourth to G. W. Conrad and one-fourth to A. Conrad, Adrian, Mich., and one-half to W. G. Kelly, Winslow, Ariz. Has motor-operated semaphores controlled by relays.

1,031,542. Dissolving-View Display Apparatus. G. T. Fielding, Jr., New York, N. Y. Has a motor-driven transparent sign belt electrically illuminated alternately from the outside and inside.

1,031,561. Direct-Current Electric Motor. J. Lecoche, London, Eng. The armature has a spiral surface resembling a worm that engages corresponding teeth on a large, superposed wormwheel.

1,031,563. Photographic-Printing Device. J. W. Liebenrood, Cincinnati, O. Includes clear and ruby colored incandescent lamps that are alternately lighted.

1,031,564. Outlet Box. N. Marshall, assignor to Arrow Electric Co., Hartford, Conn. Includes a receptacle in the box and a cover secured to a split ring and inner flange.

1,031,573. Motor Control. W. Naumann, assignor to General Electric Co. Starts and reverses a motor that drives a reciprocating load.

1,031,604. Curling-Iron. C. W. Wilmot, assignor to Western Mechanical Device Co., San Diego, Cal. Has a number of heating elements connected with spaced sockets in the handle.

1,031,605. Sheet-Metal-Working Machine. J. F. Wing, Maywood, Ill. Includes an electromagnet whose switch is controlled by a punch press.

1,031,611. Door Switch. E. Anderson, assignor to Perkins Electric Switch Manufacturing Co., Bridgeport, Conn. Has the switch-operating push plate beneath the operating latch.

1,031,620. Wire-Coating Machine. J. G. Callan, assignor to General Electric Co. For insulating wire conductors.

1,031,626. Spark Plug. G. C. Davis, New York, N. Y. Has a rotatable jacket for registering two sparking points.

1,031,650. Starting Switch for Electric Motors. C. D. Knight, assignor to General Electric Co. Includes an electromagnetic starting switch and a similar running switch for an induction motor.

1,031,651. Driving Car-Lighting Dynamos. P. Kennedy, New York, N. Y. A special suspension for an axle dynamo.

1,031,667. Telephone Switchboard Apparatus and Circuits Therefor. H J. Roberts, Evanston, Ill., assignor to Homer Roberts Telephone Co. A selector signaling equipment in connection with a manual board.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 9, 1912:

542,228. Trolley Breaker. H. P. Ball and C. A. Lieb, New York, N. Y.

542,240. Electric Meter. F. P. Cox, Lynn, Mass.

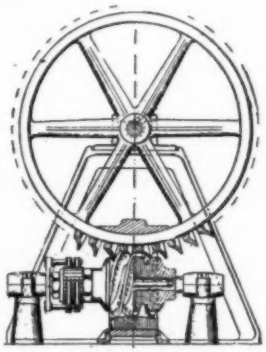
542,249. Telephone Switchboard. J. F. Gilliland, Adrian, Mich.

542,258. Electrical Measuring Instrument. F. Holden, Schenectady, N. Y.

542,262. Multiple Switchboard for Telephone Exchanges. M. G. Kellogg, Chicago, Ill.

542,268. Electroprotective System for Locks. M. Martin, Malden, Mass.

542,279. Arc-Light Support. B. Pickering, Dayton, O.



1,031,561.—Wormwheel Motor.

542,295. Transformer for Alternating-Current Systems. E. Thomson, Swampscott, Mass.

542,309. Electric Brake. W. B. Potter, Schenectady, N. Y.

542,406. Electric Alarm-Gauge. W. H. Bradt, Troy, N. Y.

542,444. Telephone Transmitter. C. C. Hughes, Baltimore, Md.

542,459. Electric Battery and Application Thereof to Medicinal Purposes. S. R. Beckwith, Orange, N. J.

542,462. Electric Insulating Material J. O. Brown, Chicago, Ill.

542,471. Electric Bath Apparatus. W. E. Golden, Auburndale, O.

542,487. Electric Lighting System and Dynamo Therefor. M. Moskowitz, Newark, N. J.

542,490. Electric Arc Lamp. S. E. Nutting, Oak Park, Ill.

542,505. Arc Lamp. A. C. Seibold, Mount Vernon, N. Y.

542,508. Medical Electrode. A. P. Van Tuyl, Jr., Brooklyn, N. Y.

542,512. Electric Railway System. R. B. Wilson, Cincinnati, O.

542,543. Electrically Controlled Motor. G. I. Thomas, Brooklyn, N. Y.

542,550. Railway Block-Signal System. G. M. Brown, Galesburg, Ill.

542,589. Electric Arc Lamp. F. M., E. S., and H. F. Hildebrandt, Baltimore, Md.

Reissue 11,503. Automatic Electric Weighing Scale. C. F. Wood, Richmond, Va.